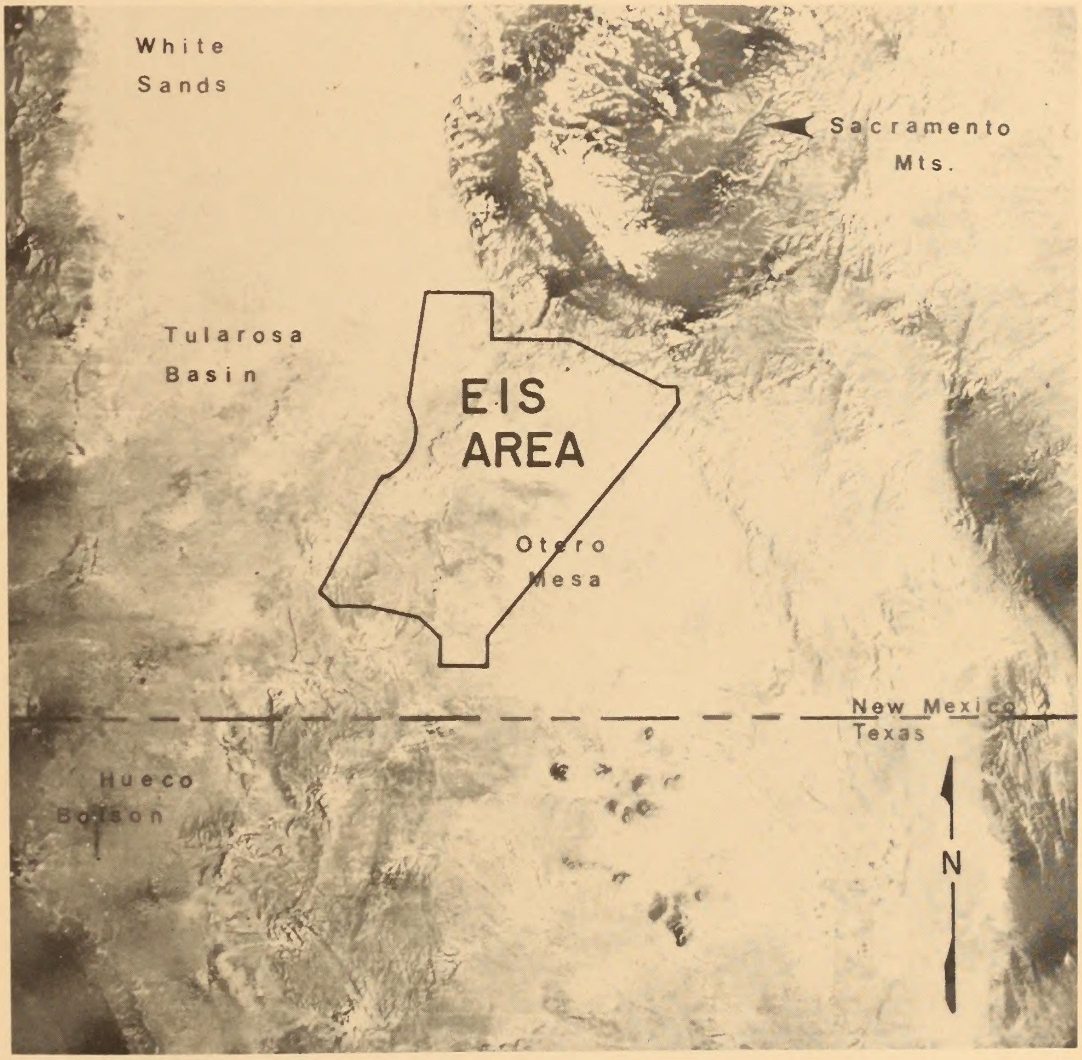
DRAFT

ENVIRONMENTAL IMPACT STATEMENT

GRAZING MANAGEMENT
McGREGOR EIS AREA, NEW MEXICO



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
LAS CRUCES DISTRICT OFFICE

APRIL, 1980

NOTICE

This draft environmental statement should be retained to be used in conjuction with the final environmental statement. The final statement will incorporate this document by reference and include the modifications and corrections which should be made to the draft as a result of public comment. The final statement will also include a record of public comments on this draft and the responses to those comments.

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

DRAFT ENVIRONMENTAL IMPACT STATEMENT ON GRAZING MANAGEMENT IN THE McGREGOR EIS AREA

Type of Action: (X) Administrative ( ) Legislative

Abstract: This Environmental Impact Statement discusses the Bureau of Land Management's proposed grazing management program and six alternative management programs for the Co-use area within the 515,000-acre McGregor Range (withdrawn by the U.S. Army) in Otero County, New Mexico. The proposed action involves the construction of improvements, and increased grazing on 271,000 acres.

Alternatives Analyzed:
a. No action (continue existing program)
b. Discontinue livestock grazing
c. Add grazing in Area A
d. Change grazing season to October-March
e. Change grazing season to October-March and reduce grazing
f. Reduce grazing on Pastures 3, 4 and 5 and provide for summer grazing.

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Comments have been requested from: See Chapter 9.

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STATE DIRECTOR, NEW MEXICO

TABLE OF CONTENTS

LIST OF TABLES

SUMMARY

SUMMARY

Proposed action. The Bureau of Land Management (BLM) proposes to implement a grazing management program for continued grazing on 271,000 acres in a Co-use area that lies within the Army-controlled McGregor Range in Otero County, New Mexico (EIS area, Exhibit A). The proposed action includes construction of new water supplies, increased utilization of key forage species, and an expanded range monitoring program. Forage for livestock grazing would continue to be sold by competitive bidding at a public auction. Livestock grazing would increase from the current 42,060 animal unit months (AUMs) to 57,230 AUMs by 1992, and would continue to be utilized on 14 pastures during a nine-month season (October to June). Deer and antelope grazing within the 14 pastures would increase from 2,793 to 4,032 AUMs. THe current policy of non-grazing on 244,000 acres of the Co-use area would remain in affect.

Existing environment. McGregor Range contains mountain foothills, canyons, mesas, a mesa rim, alluvial fans, and desert basins. The vegetation, which includes desert and mountain shrubs, short grasses, and pinyon-juniper woodlands, is subject to light utilization by grazing animals, and is generally in good to fair condition. Concentrations of cattle have caused deterioration in range condition near existing water supplies. Far from water, plants are stagnating due to light utilization. Soils are generally sandy or gravelly, and rock outcrops are common. Natural rates of wind and water erosion are substantial. Water supplies come from pipelines, wells, and surface reservoirs. Quantity and quality is adequate for livestock use. The limited livestock use has resulted in a diverse wildlife population, including 3,730 deer, 253 antelope, and a variety of small mammals, game birds, other birds, and reptiles. Cultural resource sites reflect many periods of habitation, and include camps, villages, work areas, rock art, and ranches. Erosion is the most significant agent causing deterioration of these sites. Three parcels of land containing 28,560 acres are being evaluated as potential Wilderness Study Areas. Present land uses within the Range are limited to military activities, grazing, wildlife, and some hunting. Annual income to the livestock industry from use of the Range is estimated to average $994,800.

Impacts from the proposed action. The most significant quantifiable impacts from the proposed action are summarized in Exhibit B. They include changes caused by: a) construction of improvements; b) decreased grazing near existing water supplies; c) increased grazing near new water facilities; and d) increased forage utilization. Impacts which are not quantified, but which would be significant, include a decrease in the amount of plant litter, and an increase in plant vigor. Wildlife populations would generally be maintained or enhanced, and recreation opportunities related to hunting also would increase. Trampling and erosion of cultural resources would increase near new water facilities, but effects would be mitigated by design features of the proposed action. There would be no significant impacts to visual resources, wilderness, or transportation.

Unavoidable adverse impacts. Near new water facilities, range condition would go down by one class on 4,425 acres, and soil compaction would occur on 800 acres. These changes would cause decreases in plant cover and increases in soil erosion, as shown in Exhibit B.

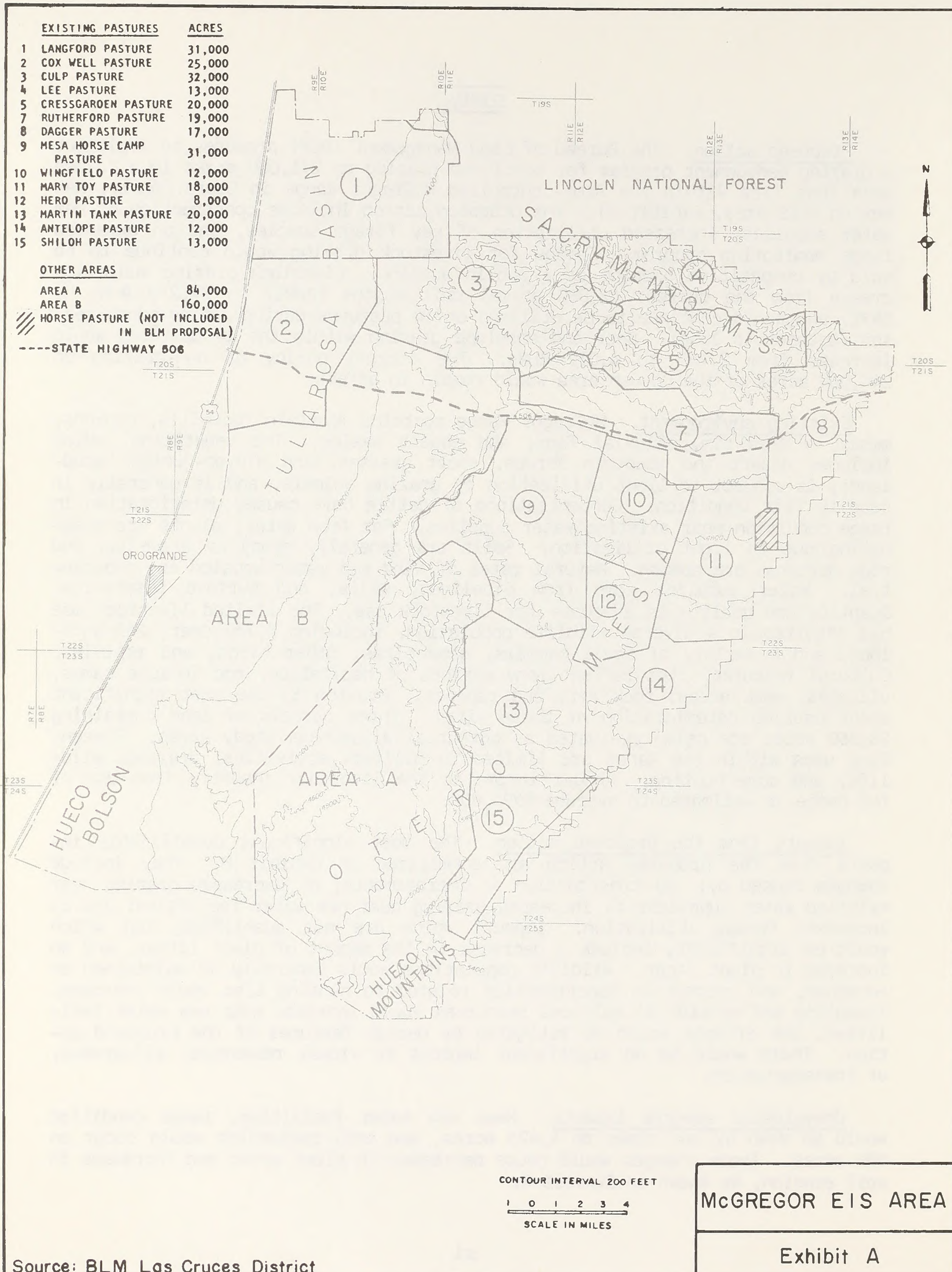

EXISTING PASTURES ACRES
1 LANGFORD PASTURE 31,000
2 COX WELL PASTURE 25,000
3 CULP PASTURE 32,000
4 LEE PASTURE 13,000
5 CRESSGARDEN PASTURE 20,000
7 RUTHERFORD PASTURE 19,000
8 DAGGER PASTURE 17,000
9 MESA HORSE CAMP PASTURE 31,000
10 WINGFIELD PASTURE 12,000
11 MARY TOY PASTURE 18,000
12 HERO PASTURE 8,000
13 MARTIN TANK PASTURE 20,000
14 ANTELOPE PASTURE 12,000
15 SHILOH PASTURE 13,000
OTHER AREAS
AREA A 84,000
AREA B 160,000
HORSE PASTURE (NOT INCLUDED IN BLM PROPOSAL)
STATE HIGHWAY 506
LINCOLN NATIONAL FOREST
SACRAMENTO MTS
TULAROSA BASIN
OTERO MESA
AREA A
AREA B
OROGRANDE
HUECO BOLSON
HUECO MOUNTAINS
N
CONTOUR INTERVAL 200 FEET
SCALE IN MILES
McGREGOR EIS AREA
Exhibit A
Source: BLM Las Cruces District

EXHIBIT B. SIGNIFICANT LONG-TERM IMPACTS OF THE PROPOSED ACTION AND THE SIX ALTERNATIVES.

RESOURCE	PROPOSED ACTION Expand grazing in existing pastures	ALTERNATIVE A No action (continue existing program)	ALTERNATIVE B Discontinue grazing	ALTERNATIVE C Add grazing in Area A	ALTERNATIVE D Change grazing season to Oct.-March	ALTERNATIVE E Change grazing season to Oct.-March and reduce grazing	ALTERNATIVE F Reduce grazing in Pastures 3, 4, 5 and provide for summer grazing
GRAZED ACREAGE	271,000	271,000	none	355,000	271,000	271,000	225,000
UNGRAZED ACREAGE	244,000	244,000	515,000	160,000	244,000	244,000	290,000
AVERAGE CATTLE AUMS b/	57,230	42,300	0	68,933	57,230	38,153	49,335
ECONOMIC BENEFITS TO LIVESTOCK INDUSTRY	$ 1,493,700	$ 994,800	none	$ 1,799,100	$ 1,493,700	$ 995,800	$ 1,287,700
CONSTRUCTION COSTS a/	$ 1,388,673	$ 498,960	none	$ 2,621,873	$ 1,388,673	$ 1,388,673	$ 984,294
ANNUAL OPERATING COSTS a/	$ 135,000	$ 115,000	none	$ 135,000	$ 135,000	$ 135,000	$ 135,000
AVERAGE DEER AUMS b/	3,597	2,633	1,799	5,096	3,597	3,597	3,597
AVERAGE ANTELOPE AUMS	435	160	160	435	435	435	435
ACRES OF VEGETATION AND HABITAT ELIMINATED	97	0	0	162	97	97	72
ACRES OF DOWNWARD TREND STABILIZED (S) OR REVERSED (R)	S: 4,400	0	R: 4,400	S: 4,400	0	S: 4,400	S: 2,100 R: 2,300
ACRES CHANGING ONE CONDITION CLASS DOWNWARD	4,425	0	0	5,075	8,850	4,115	2,125
HERBAGE YIELDS, POUNDS/ACRE/YEAR b/	502	560	502	502	502	560	502
PLANT COVER, PERCENT	20.4	20.5	20.6	20.3	20.3	20.5	20.5
WIND EROSION, MILLION TONS PER YEAR	22.0	21.6	21.2	22.2	22.5	21.6	21.6
SEDIMENT YIELD, ACRE-FEET PER YEAR	319.1	303.9	289.4	325.2	334.3	303.9	303.9
SOIL STRUCTURE ALTERED, ACRES	800	7	0	970	1,600	720	490
WATER USE, ACRE-FEET PER YEAR	135	86	77	165	140	119	126
ACRES RATED SUITABLE FOR LIVESTOCK	242,900	229,650	0	326,900	242,900	242,900	216,400

a. All costs paid from income received by BLM from sale of forage on McGregor Range.
b. Values reflect conditions in existing fourteen pastures. All other numbers in Exhibit B reflect conditions in entire Co-use area.

Source: Lee Wilson and Associates, Santa Fe, NM.

Short-term uses; long-term productivity. The proposed action would improve livestock distribution on McGregor Range, and would result in a balance between the sustained yield and consumption of forage. These gains would have economic benefits to the livestock industry, and would be associated with stabiization of range condition near existing water supplies. The environmental costs of the proposed action include deterioration of range condition near new water supplies, and associated changes in plant cover and soil erosion.

Irreversible commitments of resources. Permanent resource commitments would include: 97 acres of productive land to be used for range improvements; wind erosion of 0.4 million tons of soil per year (in addition to natural erosion); water erosion of 15.2 acre-feet of soil per year (in addition to natural erosion); increased trampling and erosion of cultural resources; and investments of funds and materials.

Alternatives. The impacts of the six alternatives are compared to the proposed action in Exhibit B. Alternative A would take no action, thus continuing the existing program. There would be no increase in forage use on McGregor Range and continued deterioration of range condition near existing water supplies. Alternative B would discontinue the grazing program, eliminating livestock use on McGregor Range. Range condition would improve, but the vegetation would stagnate. Erosion would be reduced, and deer populations would be adversely affected. The rate of deterioration of cultural resources would be slowed. Alternative C would expand the proposed action by providing improvements and grazing on 84,000 acres in Area A (Exhibit A). This would add 11,703 additional livestock AUMs. Impacts would be similar to those of the proposed action, but would be greater in magnitude due to the increased area affected. Alternative D would implement the proposed action, but would change the grazing season to October-March. This would benefit cool-season plants, which are a relatively minor part of the plant community. The number of cattle on the Range during the abreviated grazing season would double compared to present levels, which would cause substantial adverse impacts near all water facilities. These impacts are quantified in Exhibit B. Alternative E would implement the construction program of the proposed action, change the grazing season to October-March, and reduce AUMs to 38,153, which is less than at present. Range condition would benefit from the reduced grazing, and economic benefits would be foregone. Alternative F would eliminate grazing in the northern upland parts of the 14 pastures, while providing summer grazing elsewhere to improve forage utilization. Impacts would be similar to those from the proposed action, except in the northern pastures, where the benefits and adverse effects of the existing grazing program (and the proposed action) would be eliminated.

CHAPTER 1

DESCRIPTION OF THE PROPOSED ACTION

CHAPTER 1. DESCRIPTION OF THE PROPOSED ACTION

INTRODUCTION

This Environmental Impact Statement (EIS) analyzes the environmental consequences of implementing a grazing management program for the Co-use area of the McGregor Range. The Range covers 698,000 acres of withdrawn public lands and Army fee-owned lands in Otero County, New Mexico. Since 1957 the Range has been controlled by the Department of the Army (DOA), Fort Bliss, Texas. The Range is used for artillery and missile firing, desert maneuvers, and other military purposes. In 1966, DOA designated a portion of the Range as a Co-use area, in which grazing could be permitted under supervision of the Bureau of Land Management (BLM). Figure 1-1 shows the location of the Co-use area, which is the region studied in this EIS. The area contains 515,000 acres. Grazing is allowed in fourteen pastures, containing 271,000 acres. Thirteen of the pastures were developed in the 1960s; one will be available for grazing in 1981. Figure 1-2 shows the location of these pastures, and the location of two additional areas discussed in the EIS, Area A (84,000 acres) and Area B (160,000 acres).

OBJECTIVES OF THE PROPOSED ACTION

The proposed action is to implement a grazing management program for the Co-use area. Specific objectives are to:

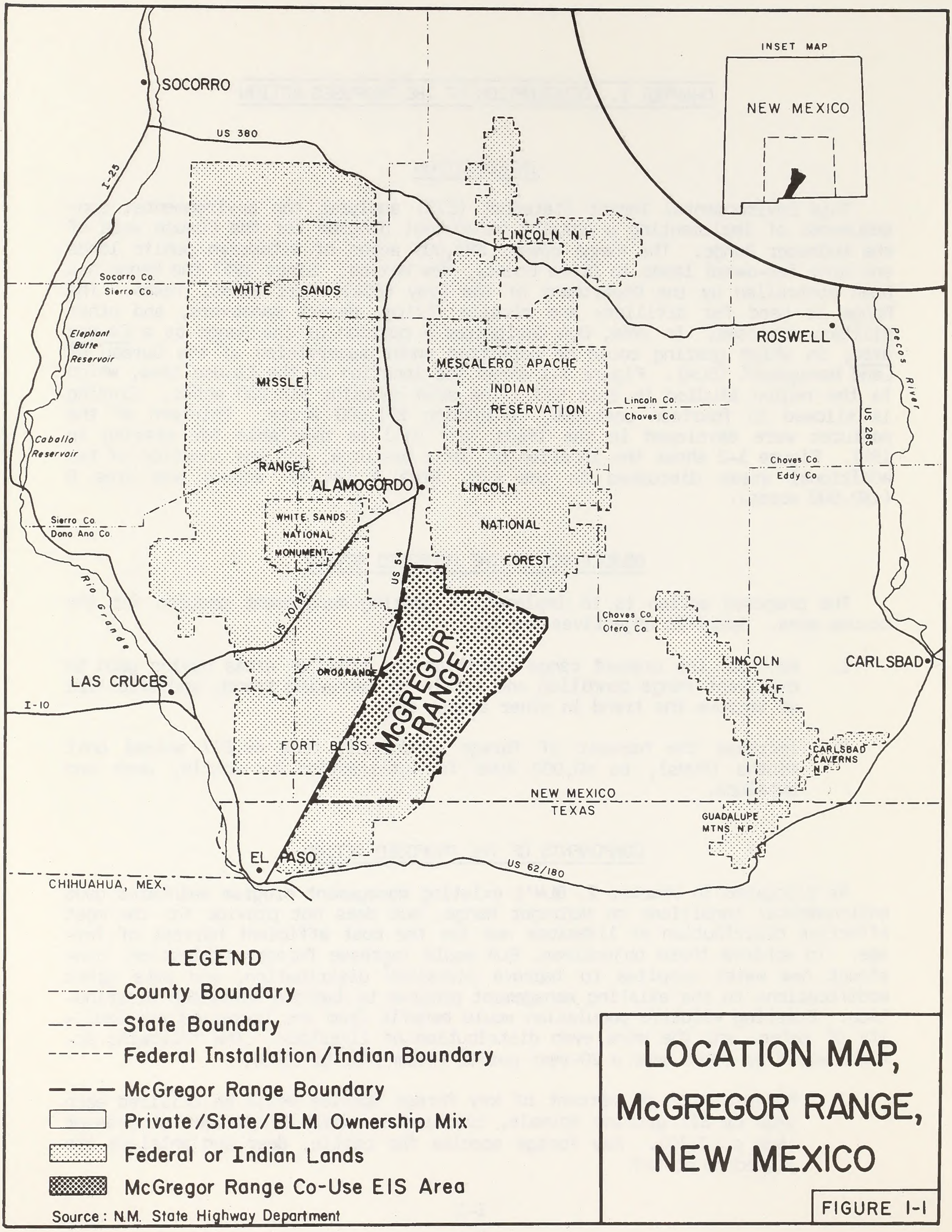
1. maintain the present range condition and trend on areas having good to excellent range condition and stable to improving trend, and stabilize or improve the trend in other areas; and

2. increase the harvest of forage production from 49,877 animal unit months (AUMs), to 60,000 AUMs for utilization by cattle, deer and antelope.

COMPONENTS OF THE PROPOSED ACTION

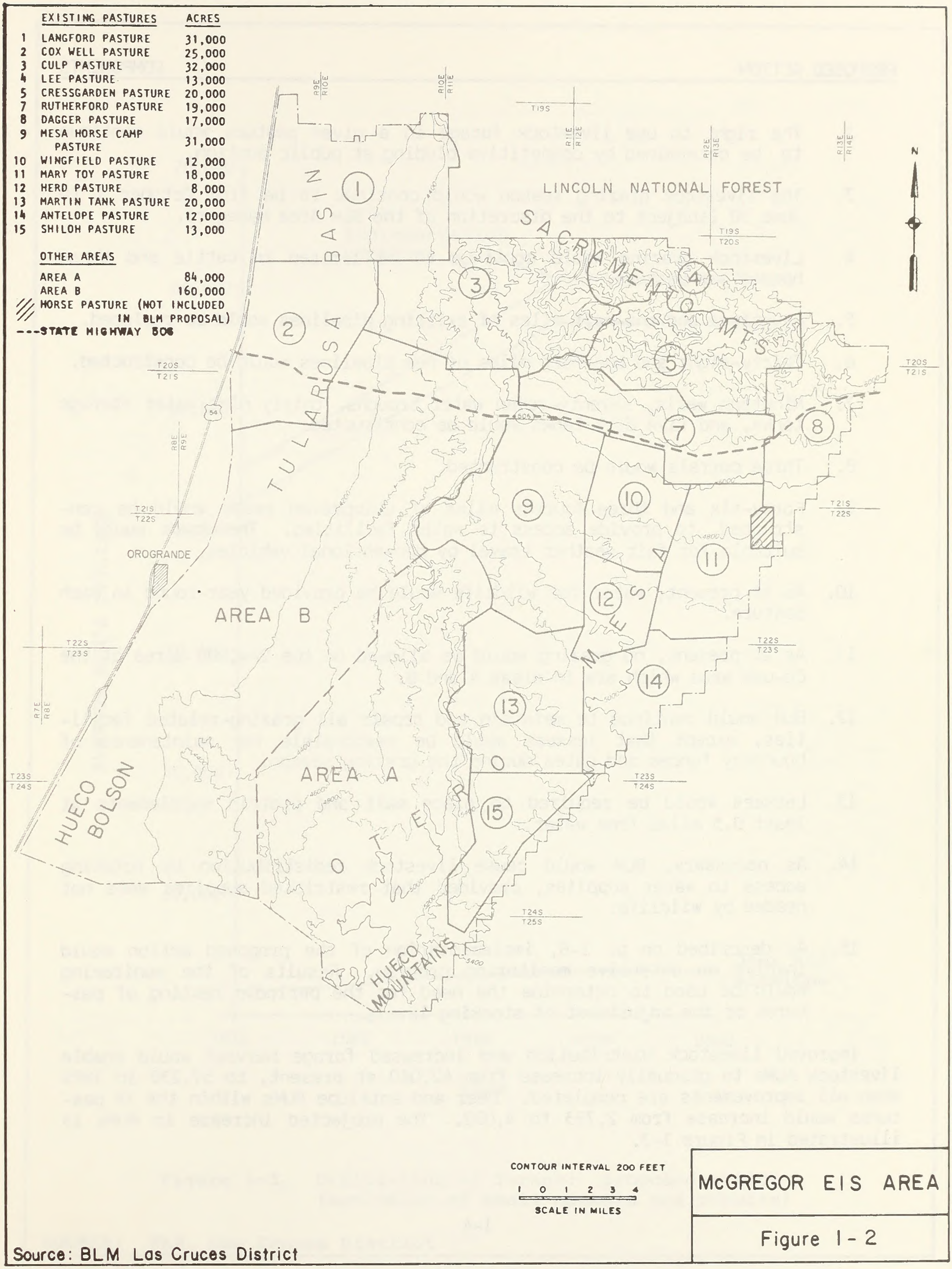
As discussed in Chapter 2, BLM's existing management program maintains good environmental conditions on McGregor Range, but does not provide for the most effective distribution of livestock nor for the most efficient harvest of forage. To achieve these objectives, BLM would increase forage utilization, construct new water supplies to improve livestock distribution, and make minor modifications to the existing management program to improve livestock distribution. Existing wildlife population would benefit from the increased availability of water, and the more even distribution of livestock. The following actions would be taken over a 20-year period (from 1981 to 2000).

1. No more than 50 percent of key forage species would be utilized each year by all grazing animals, compared to about 32 percent at present (see p. 2-10). Key forage species for cattle, deer and antelope are listed on p. 3-2.



LOCATION MAP, McGREGOR RANGE, NEW MEXICO

FIGURE I-1



Source: BLM Las Cruces District

McGREGOR EIS AREA

Figure 1-2

2. The right to use livestock forage in a given pasture would continue to be determined by competitive bidding at public auction.

3. The livestock grazing season would continue to be from October 1 to June 30 (subject to the discretion of the BLM Area Manager).

4. Livestock grazing would continue to be limited to cattle and three horses per pasture.

5. Seventeen and one-half miles of existing pipelines would be replaced.

6. Thirty-eight and one-half miles of new pipelines would be constructed.

7. Nineteen wells, seventy-seven water troughs, thirty nine water storage tanks, and five dirt tanks would be constructed.

8. Three corrals would be constructed.

9. Forty-six and three-fourths miles of unimproved roads would be constructed, to provide access to water facilities. The roads would be suitable for fair weather travel by conventional vehicles.

10. As at present, water for wildlife would be provided year-round in each pasture.

11. As at present, no grazing would be allowed on the 244,000 acres of the Co-use area which are in areas A and B.

12. BLM would continue to maintain and repair all grazing-related facilities, except that lessees would be responsible for maintenance of boundary fences and gates during the grazing season.

13. Lessees would be required to place salt and protein supplements at least 0.5 miles from water.

14. As necessary, BLM would cause livestock redistribution by rotating access to water supplies, provided that restricted supplies were not needed by wildlife.

15. As described on p. 1-6, implementation of the proposed action would involve an extensive monitoring program. Results of the monitoring would be used to determine the need for the periodic resting of pastures or the adjustment of stocking levels.

Improved livestock distribution and increased forage harvest would enable livestock AUMs to gradually increase from 42,060 at present, to 57,230 in 1992 when all improvements are completed. Deer and antelope AUMs within the 14 pastures would increase from 2,793 to 4,032. The projected increase in AUMs is illustrated in Figure 1-3.

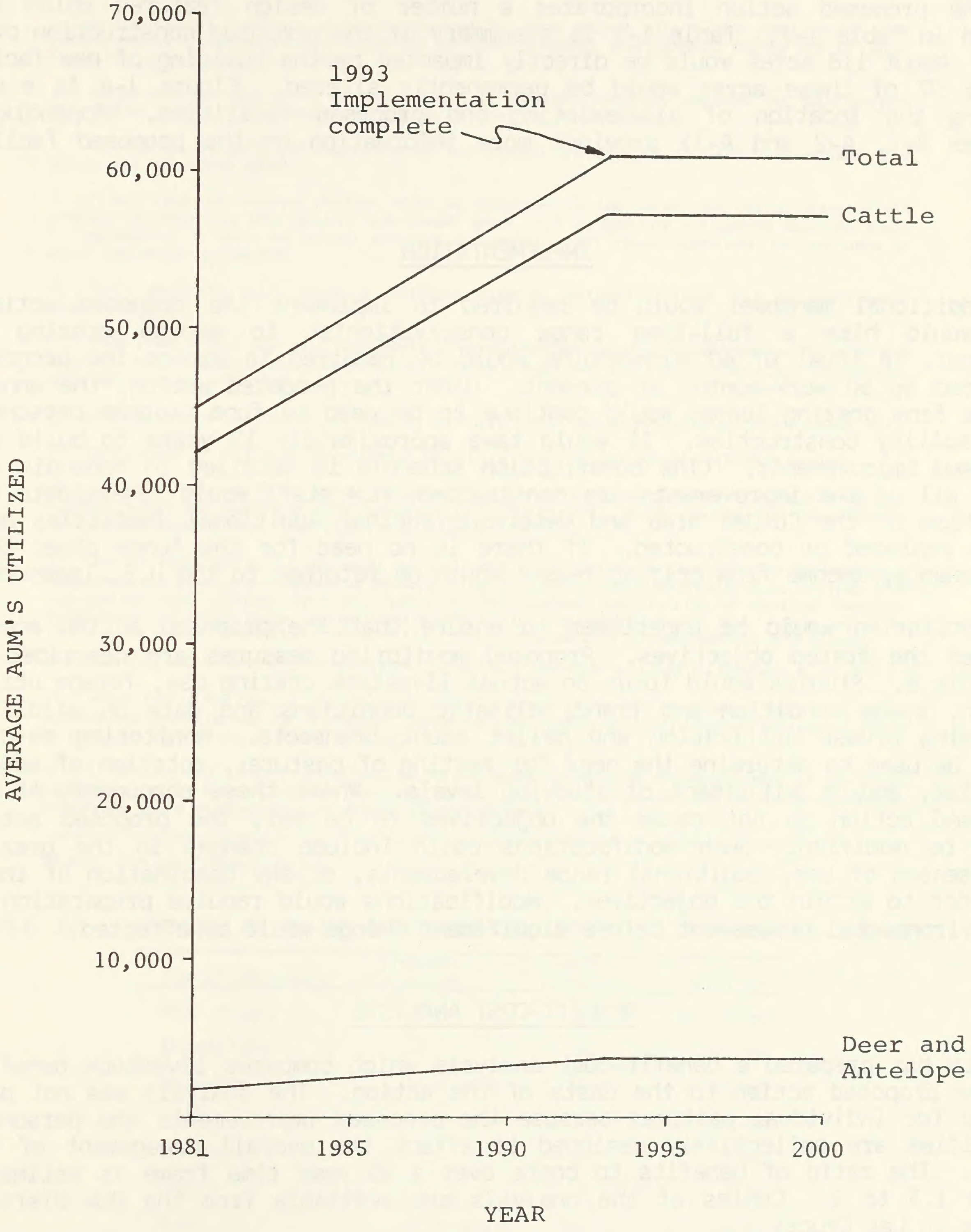


Figure 1-3. Utilization of forage: proposed action (exclusive of small mammals and rabbits)

SOURCE: BLM, Las Cruces District

The proposed action incorporates a number of design features which are listed in Table 1-1. Table 1-2 is a summary of the proposed construction program. About 118 acres would be directly impacted by the building of new facilities; 97 of these acres would be permanently altered. Figure 1-4 is a map showing the location of all existing and proposed facilities. Appendix A (Tables A-1, A-2 and A-3) provides more information on the proposed facilities.

IMPLEMENTATION

Additional manpower would be required to implement the proposed action. BLM would hire a full-time range conservationist to manage grazing on McGregor. A total of 60 work-months would be required to manage the program, compared to 50 work-months at present. Under the proposed action, the annual income from grazing leases would continue to be used to fund program personnel and facility construction. It would take approximately 12 years to build all proposed improvements. (The construction schedule is detailed in Appendix A). After all of the improvements are constructed, BLM staff would re-evaluate the condition of the Co-Use area and determine whether additional facilities need to be replaced or constructed. If there is no need for the funds other than maintenance, income from grazing leases would be returned to the U.S. Treasury.

Monitoring would be undertaken to ensure that the proposed action accomplishes the stated objectives. Proposed monitoring measures are described in Appendix B. Studies would focus on actual livestock grazing use, forage utilization, range condition and trend, climatic conditions and data on wildlife, including browse utilization and pellet count transects. Monitoring results would be used to determine the need for resting of pastures, rotation of access to water, and/or adjustment of stocking levels. Where these components of the proposed action do not cause the objectives to be met, the proposed action would be modified. Such modifications could include changes in the grazing use, season of use, additional range developments, or any combination of these in order to attain the objectives. Modifications would require preparation of an Environmental Assessment before significant change would be effected.

BENEFIT-COST ANALYSIS

BLM has prepared a benefit-cost analysis which compares livestock benefits of the proposed action to the costs of the action. The analysis was not performed for individual pastures because the proposed improvements and personnel activities are collectively designed to affect the overall management of the Range. The ratio of benefits to costs over a 20 year time frame is estimated to be 1.3 to 1. Copies of the analysis are available from the BLM District Office in Las Cruces.

TABLE 1-1. DESIGN FEATURES OF THE PROPOSED ACTION.

1. Roads or trails would be constructed only where existing roads and trails could not be used or when off-road travel is not possible (BLM policy).

2. Archaeological clearance would be required for each project site before construction (BLM policy: National Historic Preservation Act of 1966; National Environmental Policy Act of 1969: Executive Order 11593; 36 CFR 800).

3. Threatened and endangered species survey and clearance would be required for each project site before construction (Endangered Species Act and BLM Manual 6840).

4. Disturbance of soil and vegetation at all project sites would be held to a minimum (BLM policy and BLM Manual 6300).

5. Visual resource contrast ratings would be completed in the survey and design stage of all proposed developments (BLM policy; BLM Manual 8400), and appropriate mitigating measures would be implemented to meet the Visual Resource Management (VRM) class objectives for the area in which the action is located.

6. Areas where the soils would be disturbed would be restored to blend into the environment (BLM policy).

7. A soils scientist and soil maps would be consulted for on site investigations to determine areas of least impact. i.e., avoid soils on steep slopes and soils in critical and severe erosion condition classes (BLM policy).

8. Construction of all fences would be in accordance with design constraints in BLM Manual 1737.

9. Water would be available for wildlife in all units during periods of rest (BLM policy).

10. In any Wilderness Study Areas management activities would be governed by BLMs interim management policy and surface protection regulations (BLM policy), which require that no action be taken which would detract from wilderness values.

11. Before construction or placement of salt, BLM would prepare a site specific Environmental Assessment to analyze environmental impacts. The assessment would encompass areas no less than one-quarter mile diameter from the center of the proposed construction or salting location. Maintenance of major range improvements would be the responsibility of BLM. Users would be required to obtain permission from BLM prior to any construction of improvements (BLM policy).

12. Pastures would be rested in accordance with the procedures outlined in Appendix B, p. B-1.

13. Where the objectives of the proposed action are not being met. vegetation manipulation by approved BLM methods may be attempted. Prior to such action an Environmental Assessment would be prepared (Las Cruces District Policy).

14. If the desired pattern of utilization is not being achieved by the development of new water facilities, cross fencing in some units may be necessary. Prior to such action an Environmental Assessment would be prepared (Las Cruces District Policy).

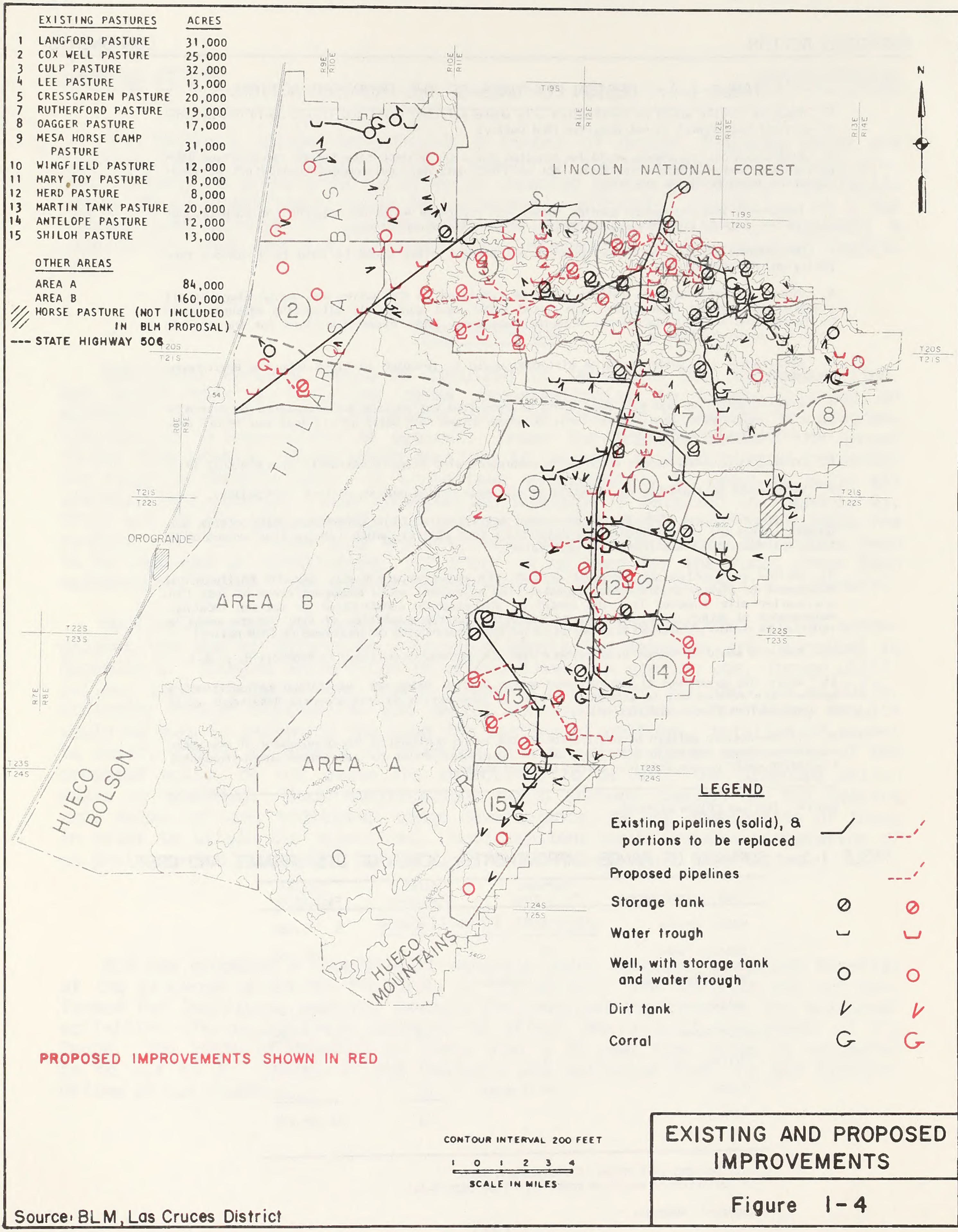
Source: BLM Las Cruces District.

TABLE 1-2 SUMMARY OF RANGE IMPROVEMENTS, ACRES OF DISTURBANCE AND COST.

Type of Improvement	Proposed Facilities	Acres Disturbed	Cost of Facilities
Water Troughs	77	8	$ 34,650
Storage Tanks	39	9	291.500
Water Pipelines	56 miles a/	21 b/	600.260
Wells	19	5	407.500
Dirt Tanks	5	10	17.500
Corrals	3	1	9,000
Roads	46.75 miles	64	28,263
TOTALS		118	$1,388.673

a. Includes 17.5 miles of replacement line.
b. Disturbance would be short-term (see page 3-14).

Source: Appendix A.



EXISTING AND PROPOSED IMPROVEMENTS

Figure 1-4

INTERRELATIONSHIPS WITH FEDERAL, STATE, AND LOCAL PROGRAMS

McGregor Range is unique among land managed by BLM in that it is primarily used for military purposes by DOA. Grazing is governed by a Co-use agreement between the Department of Interior (DOI) and DOA. Management of other resources on the Range (such as wildlife) are governed by additional agreements. Appendix B contains information on the agreements which govern the interrelationships among various Federal and State entities involved in the management of the Range.

ENVIRONMENTAL LAWS AND REGULATIONS

National Environmental Policy Act (NEPA). The proposed action is intended to create and maintain conditions under which man and nature can exist in productive harmony, and thus is consistent with the basic Federal environmental policy set forth in Section 101(a) of NEPA. There are six specific environmental objectives of Federal actions set forth in Section 101(b) of NEPA, as follows.

1. To fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

2. To assure for all Americans safe, healthful, productive and esthetically and culturally pleasing surroundings.

3. To attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable or unintended consequences.

4. To preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice.

5. To achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.

6. To enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The primary military mission of the McGregor Range limits management of the Co-use area, and restricts BLM's ability to provide for a wide range of beneficial uses (objective 3), and for a variety of individual choices (objective 4). All of the remaining objectives are expected to be achieved by the proposed action. Changes in livestock distribution would enhance the quality of the vegetation, the most important renewable resource on the Range (objective 6). Implementation of various design features would mitigate impacts of the proposed action, thus preserving important environmental elements (objective 4), minimizing environmental harm (objective 3), and protecting the surroundings (objective 2). Increases in livestock, deer and antelope numbers would help achieve a more productive balance between population and resource use

(objectives 2 and 5). The result of the actions should be an environment which overall is similar in quality to the existing environment, thus maintaining the Range for the use of succeeding generations (objective 1).

Federal Land Policy and Management Act (FLPMA) and Public Rangelands Improvement Act (PRIA). With a prime mission of military use on the McGregor Range, opportunities for the proposed action to provide for management of the Co-use area for a wide range of benefits has been severely limited. However, the principle of sustained yield set forth in the FLPMA would be achieved, and the productivity capability of the Range will be improved and maintained. The actions would implement the intent of the Public Rangelands Improvement Act of 1978, by addressing existing problems of lands which are in unsatisfactory condition, and by managing the land so that productivity approaches the long-term potential of the area.

Other Federal Laws. The proposed action has been developed in conformance with other Federal environmental laws and regulations, including the National Historic Preservation Act, Antiquities Act, Endangered Species Act, Fish and Wildlife Coordination Act, Clean Water Act, and Clean Air Act.

BLM MULTIPLE USE PLANNING

BLM has a comprehensive process to develop multi-objective plans for the public lands it manages. In 1977 BLM completed a Unit Resource Analysis (URA), which provides a resource inventory of the Co-use area. A Resource Management Plan (RMP) will be completed as part of the White Sands RMP presently scheduled for 1988-1989. The RMP will provide further guidance to BLM's management of livestock grazing and wildlife habitat in the Co-use area.

OTHER FEDERAL PROGRAMS

Department of the Army (DOA). In accordance with the Co-use agreement DOA concurrence would be required prior to construction of all proposed improvements. Access to the Range by BLM personnel and by lessees would be subject to DOA control. The proposed action would be designed and operated so that it would not interfere with military use of the Range. Responsibility for management of grazing, cultural, and wildlife resources on the grazing units would remain with BLM. Management responsibilities for mineral resources and right-of-ways for non-military uses would remain with BLM on the Co-use area. Responsibility for management of grazing, cultural and wildlife resources off the grazing units would remain with DOA.

Fish and Wildlife Service (FWS). Under the Endangered Species Act of 1973 (PL 93-205), the Fish and Wildlife Coordination Act, as amended (PL 85-624, 72 Stat. 563, 16 USC 661), and animal damage control programs, the Fish and Wildlife Service (FWS) has responsibilities to cooperate with other Federal and State agencies in relation to wildlife.

FWS has primary responsibility for control of predatory animals and rodents on public lands when damage to other resources by these animals can be docu-

mented. FWS handles reports of animal damage or predation, compiles records, and carries out animal damage control practices on areas that have been authorized by BLM. To date there has been no need for predator control in areas where grazing has been allowed, and none is anticipated for the Co-use area.

On December 20, 1979, BLM requested formal consultation with the FWS as provided by Section 7 of the Endangered Species Act of 1973. Regulations governing interagency consultation (43 CFR 870-876) require Federal agencies to enter into formal consultation if it is determined a Federal action would or may affect endangered or threatened species or their habitats. FWS replied on 11 January, 1980, and identified the Kuenzler hedgehog cactus and the peregrine falcon as listed endangered species which may exist within McGregor Range. No species proposed as endangered or threatened were identified and no critical habitat was identified.

STATE AND LOCAL PROGRAMS

New Mexico Department of Game and Fish (NMDGF). A cooperative agreement is in effect between BLM and NMDGF which requires NMDGF to be responsible for various aspects of wildlife management, including an annual survey of range condition, herds and wildlife abundance, designation of hunting seasons and enforcement of hunting regulations. In practice, however, BLM takes responsibility for necessary habitat studies. The proposed action is designed to increase the deer and antelope herds on the Range. NMDGF is unlikely to experience increased personnel needs or expenditures as a result of the proposed action. However, Department revenues may increase as more hunters are allowed on the Range.

New Mexico State University (NMSU). A cooperative agreement is in effect between BLM, DOA and NMSU. Under the agreement, NMSU would be responsible for research programs in four areas of black grama grasslands which are excluded from grazing (see Figure 2-9). The NMSU program would not be affected by the proposed action, because grazing will continue to be excluded from these research areas.

City of Alamogordo. Water rights for the Orogrande pipeline are owned by the City of Alamogordo. To expand existing water use to serve new facilities along this pipeline, it would be necessary to secure permission from the City.

CHAPTER 2

DESCRIPTION OF THE EXISTING ENVIRONMENT

CHAPTER 2. DESCRIPTION OF THE EXISTING ENVIRONMENT

INTRODUCTION

Information on the existing environment of McGregor Range is available from: the Unit Resource Analysis (URA) prepared by the Bureau of Land Management (BLM) in 1977; an Environmental Impact Statement (EIS) on the military withdrawal of the Range (DOA, 1977); field studies performed in 1979 as part of this EIS; and other published and unpublished reports. The field studies are the primary source of data on the vegetation and wildlife resources of the Co-use area. The studies also provide information on soils, water, cultural resources and other environmental characteristics.

The degree of detail in the description of each resource relates directly to the degree of anticipated impacts. The level of detail is controlled to some extent by the following: most studies of McGregor Range have been at a reconnaissance scale; vegetation and wildlife data are very limited in areas A and B (Figure 1-2); and data on seasonal and long-term variations in environmental conditions are not available for most resources.

NATURAL UNITS

A natural unit is an area with a certain typical pattern of landforms, soils and vegetation. Normally land-use patterns, wildlife habitats, cultural resources and other natural and man-made features are distributed (at least partly) according to natural units. The identification, mapping and description of the natural units of an area thus provides a very useful summary of environmental conditions on a regional scale.

The Co-use area of McGregor Range is divided into six distinctive natural units:

1. The Mountain Foothills unit (23.4 square miles) occurs at the north end of the Range and is an upland area with a characteristic pinyon-juniper woodland.

2. The Canyonlands unit (59.4 square miles) is the rugged, rocky lands which separate the Mountain Foothills from the lower country to the south and west.

3. The Mesa (171.1 square miles) is a gently rolling grassland in the southeastern portion of the Range.

4. The Rimlands unit (100.0 square miles) is the rugged, rocky area which separates the Mesa from the lower country to the west.

5. The Alluvial Fans unit (296.9 square miles) is sloping shrublands at the foot of the Canyonlands and Rimlands units.

6. The Bolson, or Basin (153.1 square miles), is the lowland area on the west side of the Range, characterized by the presence of stabilized sand dunes.

The distribution of the units is shown on Figure 2-1. Table 2-1 provides an extensive summary of the natural and man-made features associated with each unit.

VEGETATION

Information on the vegetation of the fourteen existing pastures (and to a limited extent the remainder of the Co-use area) was obtained primarily by field studies during the summer of 1979. The study methodology and results are presented in a report by Pettit et al. (1980). Findings essential to the analysis of grazing impacts are summarized in Appendix C. The data are adequate to describe regional patterns in the plant cover of the grazed portion of the Co-use area, and to evaluate site-specific relationships in key areas affected by the present grazing program.

VEGETATION SUBTYPES

The major vegetation subtypes on McGregor Range are short grass, creosotebush-mesquite, goldeneye-mountain mahogany, and pinyon-juniper. These subtypes are associated with specific natural units, as described below.

The Mountain Foothills broadly correspond to the pinyon-juniper subtype of vegetation. Dominant tree species in the area are pinyon pine, alligator juniper and one-seed juniper. (Refer to the Appendix, Table C-1, for scientific names of plant species.) Where conifers are not dense, several shrubs are common, such as oaks, mountain mahogany, and algerita. Occasionally sumacs, rose, and desert ceanothus are found. The herb layer observed during the field surveys was highly variable with muhlys being most abundant. Blue grama and Arizona threeawn were common on many sample sites. Feathergrass was found in shaded positions.

The Canyonlands are characterized by the goldeneye-mountain mahogany vegetation. At lower slope positions goldeneye and mariola are most abundant in the shrub layer. Upslope, and on south-southwest exposures, century plant and ocotillo are more important. Mountain mahogany is dominant on north exposures and ridge crests. Desert ceanothus is also important. Grasses consistently found in all locations include sideoats grama and curlyleaf muhly. Needlegrass and threeawns are commonly found. Along drainages, Apache plume, goldeneye, baccharis and desert willow are found. The understory is often comprised of forbs if disturbed, and sacaton if not disturbed. Alkaligrass is dominant along arroyo banks which lack shrubby growth.

Mesa vegetation consists of a grassland with varying amounts of shrubs interspersed. The six major grasses are: blue grama; black grama; sideoats grama; New Mexico feathergrass; tobosa; and burrograss. Hairy grama is important on limestone hills. Black and blue grama are the most extensive since they occur on most soils within this unit. Feathergrass occupies the gravelly ridges and slopes on the southern part of the unit. Sideoats grama is often an associate of feathergrass. The remaining species are usually on finer textured

TABLE 2-1. NATURAL UNITS OF MCGREGOR RANGE.

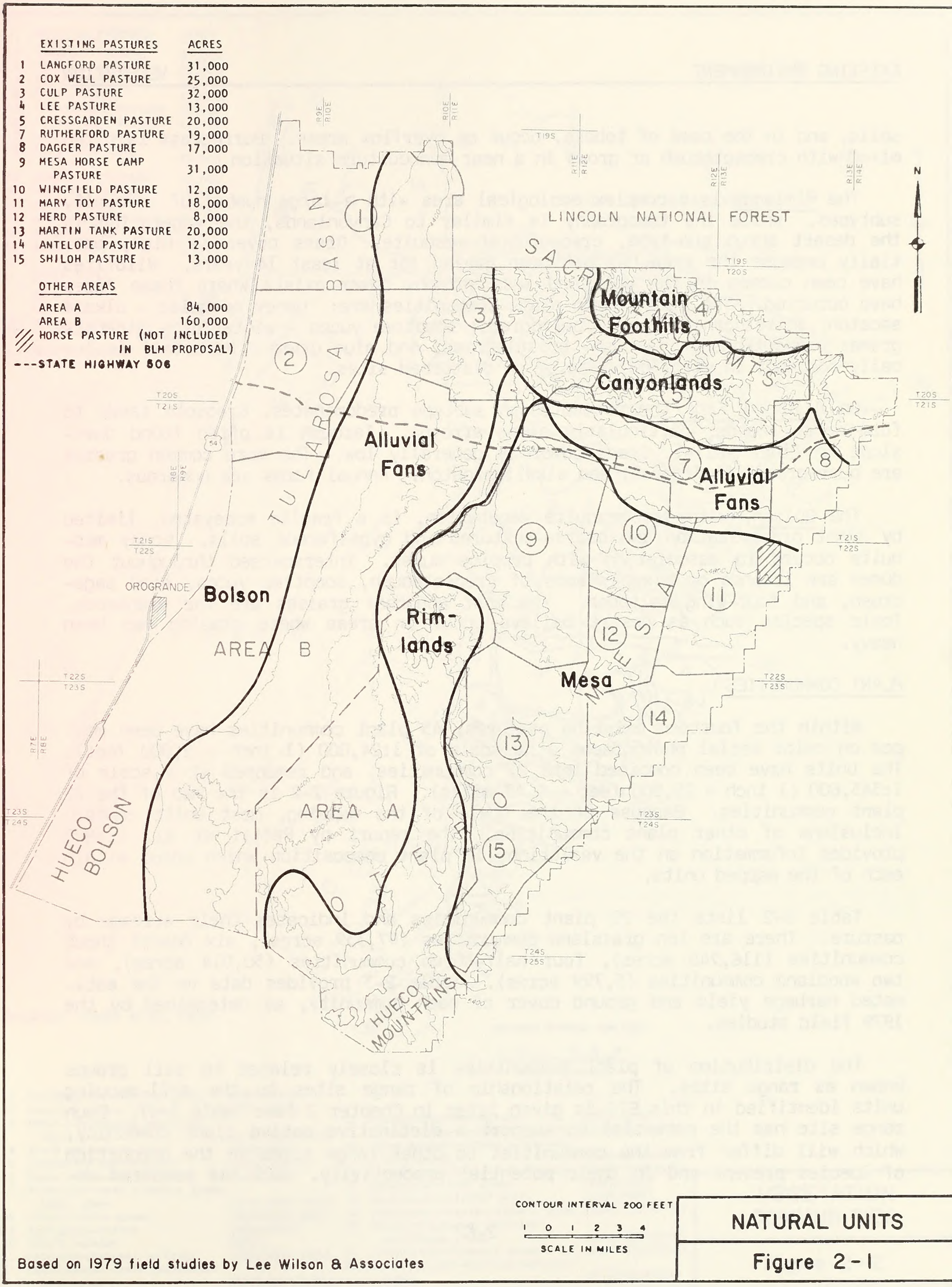
NATURAL UNIT	TERRAIN AND CLIMATE	GEOLOGY	HYDROLOGY
MOUNTAIN FOOTHILLS 100% of Pasture 4: 13,000 acres 10% of Pasture 5: 2,000 acres 15,000 acres	Landforms: uppermost natural unit, with rolling to irregular foothills; distinguished from mountains (north of Range) and Canyonlands by distinct hydrologic divides. Elevations, relief: elevations 6000 to 7000 feet; relief generally less than a few hundred feet. Slope, exposure: 5 to 50% slopes; southerly exposure overall, but variable. Climate regime: relatively cool and moist. Temperature: annual mean maximum temperature in the high 70's to low 80's°F, mean minimum 26°F or less, average about 55°F. Precipitation: averages 14 to 18 inches/year, mostly as thundershowers but with more snow (as much as several feet) than lower elevations.	Stratigraphy: dolomites occur at depth, with interbedded limestone and sandstone mixes above; rocks range in age from Cambrian to Permian; uppermost units are resistant limestones of the San Andres Formation. Structure: Sacramento Mtns are late Tertiary fault-block uplift; faults probably active. Resources: none of significance. Hazards: none of significance.	Drainage: intermittent gravel-covered washes drainage texture is medium to fine. Source of water: snowmelt and rain; Carriro Springs, and Sacramento River, feed pipelines. Aquifers: little available data; numerous potential aquifers in interbedded limestone, dolomite and sandstone. Ground water quality: little data available; one ground water sample taken above McGregor Range indicates hard alkaline water of potable quality. Ground water recharge does occur, and normally would be expected to yield water of good quality. The presence of soluble minerals in the rock formations, particularly gypsum in the Yeso Formation, causes water quality to deteriorate rapidly with distance from the recharge area.
CANYONLANDS 40% of Pasture 3: 13,000 acres 90% of Pasture 5: 18,000 acres 5% of Pasture 7: 1,000 acres 35% of Pasture 8: 6,000 acres 38,000 acres	Landforms: rolling to very steep limestone foot slopes, canyons and ridges exhibiting exposures of horizontally bedded limestone making a step-like topography; much more rugged to the west; divided from alluvial lands by distinct changes in grade and by vegetation changes. Elevations, relief: 5200 to 6000 feet; up to several hundreds of feet of local relief. Slope, exposure: 30 to 75% slopes, generally facing west or south. Climate regime: dry; with variable microclimate. Temperature: average maximum of 80-90°F, average minimum of 26°F, mean annual of 55-60°F. Precipitation: 12-14 inches per year on the average.	Stratigraphy: see Mountain Foothills; exposures of Yeso, Abo, and Gobbler Formations of Permian and Pennsylvanian age; and on the west only, outcrops of older units to Precambrian. Structure: Uplifted block bounded by a fault zone downthrown to the west, with vertical displacement of 3500 feet or less, decreasing southwards; numerous fault scarplets (see Alluvial Fans). Resources: on the west occur exposures of impure gypsum, building stone and high calcium limestone, all classed as subeconomic by the URA. Hazards: rockslides are common throughout the unit.	Drainage: intermittent entrenched washes of medium to coarse texture; principal canyons are El Paso, Wildcat, Culp, Grapevine and Bug Scuffle. Source of water: rain, snowmelt and runoff from mountain foothills. Aquifers: ground water movement close to the Sacramento Mountain front is probably westerly, towards the discharge areas of the Tularosa Basin. Away from the mountain front, ground water probably moves southeasterly in the east-dipping bedrock towards the discharge areas of the Salt Basin. See Mountain Foothills for description of potential ground water availability. Water quality: surface water quality is good; see Mountain Foothills for discussion of ground water quality.
MESA 5% of Pasture 7: 1,000 acres 5% of Pasture 8: 1,000 acres 100% of Pasture 9: 31,000 acres 75% of Pasture 10: 9,000 acres 90% of Pasture 11: 16,000 acres 100% of Pasture 12: 8,000 acres 95% of Pasture 13: 19,000 acres 100% of Pasture 14: 12,000 acres 100% of Pasture 15: 13,000 acres 110,000 acres	Landforms: Otero Mesa ranges from nearly flat to gently undulating; it is marked by a broad swale on the north edge (El Paso Draw) and a narrow band of alluvial slopes bisecting the mesa from northwest to southeast. Elevation, relief: descends gradually from 5200 feet in the west to 4800 feet in the northeast; relief is limited to gentle swales and low caliche-supported ridges. Slope, exposure: slopes are 1-3%, eastward away from the Rimlands; exposure is to the northeast. Climate regime: mild to hot, breezy; cooler and wetter than lowlands. Temperature: average maximum temperatures of mid 80's to low 90's°F, average minimums to 27-30°F, annual average 55-60°F. Precipitation: 10-14 inches annually; snows melt quickly.	Stratigraphy: Yeso Formation at the surface, underlain at depth by Abo Formation and Magdalena Group limestones, shales and sandstones; Yeso and Abo are limestone-gypsum and limestone-shale-gypsum. Structure: gently and uniformly eastward dipping beds; no inter-mesa faulting is apparent but detailed mapping and unit correlations have not been performed. Resources: none of significance. Hazards: sink holes and solution-collapse features are present near Prather Camp probably caused by dissolution of gypsum beds in the Yeso Formation	Drainage: Indefinite, intermittent water courses and sheet wash drain internally or to the southeast, collected into El Paso Draw and several unnamed swales and waterways. Source of water: precipitation; stock water piped in from foothills; a few wells. Aquifers: Ground water in limestone or dolomite beds is present in fractures and solution cavities which make up only a few percent of the total rock volume. The degree of fracture and cavity interconnection is unknown. Perched water may occur above clay layers. The direction of ground water movement is probably south or southwest, towards discharge areas in the Salt Basin. Water quality: dirt tank water quality is good; Prather well yields hard, potable water; see also discussion under Mountain Foothills.
RIMLANDS 5% of Pasture 3: 1,000 acres 5% of Pasture 13: 1,000 acres 65% of Area A: 54,000 acres 5% of Area B: 8,000 acres 64,000 acres	Landforms: four subunits: escarpment; limestone hills; steep footslopes; and rolling footslopes. Elevations, relief: elevations 4800 to 5200 feet; relief minimal in the south; 400 foot escarpment at mesa edge. Slope, exposure: 5 to 75% slopes, facing west along the escarpment (northwest near the Hueco Mountains). Climate regime: variable; mild. Temperature: average maximum of 85-95°F, average minimums of 28-30°F, annual mean of 55-60°F. Precipitation: 10-12 inches per year.	Stratigraphy: exposures of the Yeso and Abo Formations along the escarpment, with classic limestone erosional hills in the Magdalena Group (Pennsylvanian in age) near the Hueco Mountains. Sandstones are more common than in the Canyonlands. Structure: gently and uniformly eastward dipping beds; step-like in appearance in exposure. Resources: outcrops of economic/subeconomic gypsum from the Magdalena Grp are found at lower elevations. Hazards: rockslides are a potential but not frequent hazard.	Drainage: short precipitous draws in the escarpment. Source of water: precipitation; a few seeps issue from the escarpment. Aquifers: no data available; multiple aquifers may exist in the interbedded limestones and dolomites, and perched water may occur on clay layers. Water quality: surface water is of good quality; no ground water data are available. Water of good quality may be present in the outcrop areas underlain by the Magdalena Group limestones.
ALLUVIAL FANS 35% of Pasture 1 11,000 acres 55% of Pasture 3: 18,000 acres 90% of Pasture 7: 17,000 acres 60% of Pasture 8: 10,000 acres 25% of Pasture 10: 3,000 acres 10% of Pasture 11: 2,000 acres 35% of Area A: 30,000 acres 55% of Area B: 88,000 acres 179,000 acres	Landforms: individual and coalescing alluvial fans composed of sands and gravels; includes 3 subunits--the Canyonlands to Mesa fans (highest elevations), the Canyonland to Bolson fans (middle elevations), and the Mesa to Bolson fans (lower elevations). Elevations, relief: 4000-5000 feet for lower and middle fans, and up to 5200 feet on the upper subunit relief is from a few feet to a few tens of feet. Slope, exposure: slopes are generally 2-10%, but up to 40% in the middle subunit near Culp Canyon; the upper fan faces south, the middle and lower fans face west. Climate regime: warm and dry. Temperature: mean maximums of 28-30°F at lower elevations; mean minimum of 28-30°F; mean annual of 55-60°F. Precipitation: 10-12 inches; snow melts quickly.	Stratigraphy: unconsolidated sands and gravels eroded from the older rocks in the adjacent highlands; finer materials occur with increasing distance from mountains. Structure: scarplets reportedly occur in the alluvium and pediments, related to the Sacramento Uplift faults. Resources: identifiable subeconomic reserves of high-calcium limestone and sand and gravel. Hazards: none of significance.	Drainage: short, intermittent gravelly washes; principal drainages are El Paso and Wildcat Canyons on the upper fan; Culp, Bug Scuffle and Grapevine on the middle subunit, and Pendajo, Hay Meadow, Martin, Mack and Owl Tank on the lower fans; entrenched arroyos occur on the steeper fans between the Canyonlands and the Bolson. Sources of water: on-site precipitation plus runoff from upper units. Aquifers: an alluvial aquifer in basin-fill deposits; water at depths of 200-400 feet. Water quality: good quality groundwater close to the tops of fans, particularly along streams draining rocks of Pennsylvanian age and older.
BOLSON 65% of Pasture 1: 20,000 acres 100% of Pasture 2: 25,000 acres 40% of Area B: 64,000 acres 109,000 acres	Landforms: a level to gently rolling desert basin often marked by dune hummock country. Elevations, relief: 4000 to 4200 feet elevation, with no noticeable relief beyond the 3 to 6 feet high dunes. Slope, exposure: no noticeable slope or exposure except on the dunes themselves. Climate regime: warm and dry; arid; sandstorms common. Temperature: average maximum temperature of 95°F, average minimum 26-30°F; mean annual 60°F. Precipitation: 10 inches or less per year.	Stratigraphy: alluvium to depths of 5000 feet, composed of unconsolidated sands, gravels and clays. Structure: the Bolson is a down-faulted block, filled in with sediments. Resources: identifiable subeconomic reserves of blow sand. Hazards: none of significance.	Drainage: drainage is internal without well defined watercourses. Source of water: precipitation (little snow), plus runoff from alluvial units. Aquifers: semi-consolidated clastic sediments at several hundred feet. Water quality: poor to non-potable highly mineralized water (chlorides).

Source: Field studies by Lee Wilson & Associates Inc. (1979).

TABLE 2-1. NATURAL UNITS OF MCGREGOR RANGE. Continued.

	SOILS	VEGETATION	WILDLIFE	CULTURAL RESOURCES AND LAND USE
MOUNTAIN FOOTHILLS	Principal series: Ector 55%, Rock Outcrop 25%, Oeama 10%, Lozier 5%, Pena 2%, Kerrick 2%, Cale 1%. Description: Ector, Oeama and Lozier are shallow soils on steep slopes; parent materials are limestone residuum and slope colluvium, with sandstone and siltstone residuum important locally. All occur in association with rock outcrops which tend to be horizontally bedded resistant limestone. Pena, Kerrick and Cale are mapped as an association, and are deeper, highly variable soils formed in alluvium and colluvium in the valleys and, as Pena, on the valleysides and footslopes. Lozier soils are described under Canyonlands. Physical characteristics: calcareous dark thin, stony loamy soils over bedrock. Soil potentials: permeabilities are moderate; available water holding capacity (AWHC) is low to very low except for Pena and Cale. Runoff is rapid; corrosion potential moderate. Erosion: wind - nil; water - 0.47 acre-feet per square mile per year.	Indicator species: pinyon pine, alligator and one-seed juniper over forage grasses and shrubs. Associated species: shrubs, such as mountain mahogany, oakbrush, sumacs, rose and ceanothus; numerous forage grasses, especially muhlies; notable for variety. Key forage species: curlyleaf muhly, sideoats grama, needlegrass. Productivity and suitability: 500 pounds per acre per year or more; mostly unsuitable due to access, lack of water Condition and trend: good condition, stable trend	Key species: include large species such as black bear, mountain lion, mule deer, elk, and turkey, some of which are probably occasional visitors; also desert cottontail, black-tailed jack rabbit, coyote, bobcat; this unit contains the most bird species, especially abundant are the common bushtit and rufous-sided towhees, also scaled quail and mourning dove; principal small rodents are the white-footed mouse, pinon mouse and deer mouse; two notable maternal bat colonies exist. Habitat: critical deer habitat sensitive to grazing competition. Endangered & threatened species: potential habitat for McCown's longspur and Baird's sparrow; former habitat of Aplomado falcon.	Historical Sites: Oliver Lee's pipeline. Archaeological sites: principally non-ceramic burned rock loci and lithic scatters (68.8 % of unit sites); ceramic camps and ceramic burned rock loci are 25% of unit sites; no villages. (See also Tables 2-12 and 2-13). Site locations: sites found near drainages in flat areas; ave. site size 4.4 acres. Site Condition: 31% in poor condition due to water erosion. Land Use: Developments for livestock management (tanks, troughs, fences, roads, pipelines); hunting (six "primitive" hunter camps); "secondary danger zone" for missile impacts.
CANYONLANDS	Principal series: Lozier 23%, Rock Outcrop 42%, Ector 27%, Nickel 5%, Tencee 3%. Description: Ector and Lozier soils, in association with Rock Outcrop, occur on pediment slopes of the steeper limestone hills and on outlying mesas and low hills; parent material is limestone residuum and slope colluvium. Ector and Lozier are similar but the more extensive Lozier is lighter in color and slightly less deep. Rock outcrops are horizontally bedded resistant limestone. Nickel and Tencee are described under Alluvial Fans. Physical characteristics: very thin, calcareous, light colored gravelly and stony loams over bedrock. Soil potentials: moderate permeability and low to very low AWHC due to thinness and coarse fragment content. Severe limitations to most engineering uses; low shrink-swell potential. Erosion: wind - nil; water - 0.32 acre-feet per square mile per year.	Indicator species: grasses, including sideoats gramma and curlyleaf muhly. Associated species: needlegrass and three awns grass; goldeneye and mariola shrubs on lower slopes; century plant and ocotillo on upper slopes; Apache plume and desert willow along the drainages. Some juniper at upper elevations. Key forage species: curlyleaf muhly, sideoats grama, mountain mahogany. Productivity and suitability: 500 pounds per acre per year or more; half or more unsuitable because of slope. Condition and trend: uplands in good condition with stable trend; bottomlands in fair to poor condition, some downward trends	Key species: jackrabbit, bobcat, mule deer; second in bird diversity, with the common bushtit, Say's phoebe, mourning dove, and scaled quail most abundant; common rodents are kangaroo rat, white-footed mouse, deer mouse, cotton rat and silky pocket mouse. Wildlife resources rich but not quite as abundant as in the foothills. Habitat: critical deer habitat, very sensitive to grazing competition. Endangered & threatened species: see Mountain Foothills.	Historical sites: Don Lee Ranch (outbuildings and improvements). Archaeological sites : contains the greatest number of cultural resource sites, most being ceramic camps and burned rock loci. (See also Tables 2-12 and 2-13). Site locations: sites near or in major canyon systems on high ground above drainages; ave. site size 8.2 acres, majority less than 2.5 acres. Site Condition: 5% of sites in poor condition due to water erosion. Land Use: Grazing facilities, wildlife watering facilities, limited small game hunting; area is mostly in a secondary missile impact area; black gramma study site; BLM field camp and horse pasture.
MESA	Principal series: Armesa 21%, Philder 39%, Reyab 14%, Nickel 2%, Lozier 19%, Rock Outcrop 4%. Description: Armesa and Philder are derived from wind-reworked alluvium, and occur, individually, over relatively large areas on level to strongly sloping convex surfaces; they also occur associated together, with Reaker, Tome and Tencee soils, in alluvial drainages and associated sideslopes. Armesa has formed on fan-toe slopes and basin deposits; Philder has very old, partially dissected surfaces and is generally bedrock controlled. Reyab is found in broad drainages or swales in association with Armesa on the sideslopes; parent material is wind-reworked alluvium. Nickel is found in association with Tencee on dissected alluvial fans (see Alluvial Fans). Physical characteristics: calcareous, moderately fine-textured loams, very fine sandy loams, or silt loams, mostly on gentle slopes and underlain by caliche that is often indurated. Soil potentials: moderate permeabilities; low to moderately rapid AWHC depending on depth to caliche; low shrink-swell. Erosion: wind - 20 tons per acre per year; water - 0.37 acre-feet per square mile per year.	Indicator species: short grasses predominate, principally blue and black gramma. Associated species: sideoats gramma; tobosa grass; burrograss, New Mexico feathergrass; burrograss is commonly in association with creosote bush. Key forage species: black grama, blue grama, sideoats grama, New Mexico feathergrass. Productivity and suitability: 700 pounds per acre per year, or more on better sites; mostly suitable unless too far from water. Condition and trend: good condition with stable trand, except some fair or poor areas and some downward trends near water.	Key species: jackrabbit, cottontail, coyote, badger, bobcat, pronghorn antelope; key bird species are horned lark, western meadowlark, scaled quail, mourning dove and aquatic and shore birds associated with stock water; contains an impoverished rodent fauna, with the silky pocket mouse accounting for the only significant biomass; unit contains greatest density and variety of lizards; some prairie dog activity. Habitat: wildlife occurs in a nearly undisturbed state. Endangered and threatened species: potential habitat for the black-footed ferret, Baird's sparrow, McCown's longspur, Peregrine falcon, rock rattlesnake, Nelson's pocket mouse, Trans-Pecos rat snake; former Aplomado falcon habitat; the Mojave rattlesnake and the black-tailed prairie dog have been observed.	Historical sites: some remains of ranch structures Archaeological sites: the most limited of the natural units in site finds; 83% of sites are ceramic camps. (See also Tables 2-12 and 2-13). Site locations: sites near major drainages; average site size 7.4 acres. Site Condition: 83% of the sites in fair condition; some erosion by water and wind. 0% in poor condition. Land Use: Grazing facilities, wildlife watering facilities, limited small game hunting; area is mostly in a secondary missile impact area; black gramma study site; BLM field camp and horse pasture.
RIMLANDS	Principal series: Rock Outcrop 45%, (along the escarpment); Lozier soils 50% (gentler slopes away from the escarpment); Nickel 5%. Descriptions: see Canyonlands. Physical characteristics: very shallow, stony soils with outcrops of limestone along the escarpment; thin brown calcarenus to non-calcareous soil on rolling terrain and hills. Soil potentials: moderate permeability; low water holding capacity; low shrink-swell. Erosion: wind - nil; water 0.3 to 0.4 acre-feet per square mile per year.	Indicator species: shrubs predominate; the major plant communities are soaptree yucca-winterfat-sideoats gramma; whitethorn-grama-burrograss; honey mesquite-alkali sacaton; creosotebush-tarbush-burrograss; sideoats grama-muhly;. Associated species: four-wing saltbush, broom snakeweed, plains bristlegrass, blue gramma. Key forage species: black and blue grama. Productivity and suitability: production not measured; slope limits suitability. Condition and trend: good to excellent condition due to lack of historical grazing	Key species: see Mesa; also mule deer though large animal species are not abundant. The principal rodents are cactus mouse and rock pocket mouse; low species diversity and moderate densities. Habitat: sharp, steep limestone cliff fans and fairly narrow canyons. Endangered and threatened species: potential habitat for McCown's longspur, Baird's sparrow, rock rattlesnake, Nelsons pocket mouse, Peregrine falcon, Trans-Pecos rat snake; former Aplomado falcon habitat.	Historical sites: ranch buildings - 2 structures. Archaeological sites: contains all area rockshelters; one village; 35% of unit sites are ceramic camps. (See also Tables 2-12 and 2-13). Site location: sites on or near the escarpment at or near drainages; ave. site size 0.79 acres, including rock-shelters. Site condition: 14% in poor condition, due to water and vandalism. Land use: principally wildlife habitat; some hunting for deer and antelope; no grazing; Hay Meadow is included in Nike Impact area, all others are in Secondary Danger Zone.
ALLUVIAL FANS	Principal series: Nickel 45%, Tencee 35%, Philder 10%, Lozier 10% Description: Nickel soils are composed of relatively young, gravelly alluvium derived from limestone hills; generally found on less stable parts of dissected alluvial fans or occasionally on pediment toe slopes. Nickel occurs in association with Tencee soils, which are on the more stable parts of alluvial fans and on slopes adjacent to drainageways. Philder and Lozier are on relatively gentler and steeper slopes, respectively, associated with bedrock or pediment outliers: See Mesa and Canyonlands sections. Physical characteristics: surface horizons are thin, but overall soils are relatively deep, light to pale brown, calcareous gravelly sandy loam to loam (lesser slopes), with similar but more calcareous subsoils and subtrata that may be excessively gravelly at depths. Tencee is limited by an indurated caliche. Carbonate nodules and caliche fragments are common in the gravels. Soil potentials: extensive gravels make permeability moderate to moderately rapid and AWHC low to very low; shrink-swell potential is low; corrosion potential is low to moderate. Erosion: wind - 23 tons per acre per year; water - 0.46 acre-feet per square mile per year.	Indicator species: creosote bush is heavily predominant and may occur in nearly pure stands. Associated species: tarbush, broom snakeweed, alkali sacaton, fluffgrass, burrograss; an annual forbes are common. Key forage species: tobosa, blue grama. Productivity and suitability: Poor; 100 lbs/acre to 250 lbs/acre depending on density of brush, grazing use, water flow patterns and soil type; suitability limited by lack of water in many areas Condition and trend: fair condition, stable trend	Key species: Large animal species are uncommon. The principal rodents are spotted ground squirrels, kangaroo rats and western harvest mice. This natural unit has the greatest variety of small rodents; moderate densities of kingbirds, lark buntings, and Gambel's quail, but species diversity is generally low due to habitat homogeneity. Habitat: supports low species diversity Endangered & threatened species: potential habitat for Texas lyre snake, Trans-Pecos rat snake, Peregrene falcon, McCown's longspur, Baird's sparrow; former Apomado falcon habitat.	Historical sites: Ellis Wright cabin. Archaeological sites: 7 villages; 71.7% of unit sites are ceramic; many burned rock sites. Archeologically, this unit appears the richest in ceramic sites. (See also Tables 2-12 and 2-13). Site location: sites are found near major drainages and the Sacramento River; avg. site size 14.1 acres. Site condition: 8.3% in poor condition from water and wind erosion. Land use: Grazing/livestock facilities; one primitive hunting camp.
BOLSON	Principal series: Tome 35%, Oona Ana 22%, Mimbres 20%, Pintura 16%, Reeves 4%, Berino 2%, Holloman 1%. Description: Soils have developed from fine, wind re-worked sediments. Tome soils, and an extensive Mimbres-Tome association, occupy the floodplains and those broad valley floors areas that lack pronounced dune development; they occur on slightly higher ground than the finer Mimbres soils of the broad watercourses. Tome also occurs in the dune areas with Pintura and Dona Ana in a quite variable association; Pintura soils, along with Bluepoint sands, occupy the coppice dunes and Dona Ana (with Wink and Onite soils) are in the interdune areas. On the west edge of the Co-use area reddish, sandy, Berino soils occur in concave slope positions, in association with Dona Ana. Reeves and Hollnman are in association in the northwest corner of Pasture 1, with Holloman occupying slightly higher positions. Physical characteristics: Pintura, Dona Ana and Berino are non-calcareous to calcareous reddish-brown fine sands or loamy fine sands underlain by somewhat less sandy subsoils or weakly to moderately cemented caliche. Tome and Mimbres are brown and reddish brown silty soils underlain by similarly textured or somewhat heavier subsoils, with caliche weakly developed or absent. Reeves and Holloman are light-colored sandy loams underlain by gypsiferous sediments. Soil potentials: moderate to rapid permeability; generally high available water holding capacity; low to moderate shrink-swell. Erosion: wind - 140 tons per acre per year; water - 0.30 acre-feet per square mile per year.	Indicator species: honey mesquite on the dunes. Associated species: creosote bush, sand sage, four-wing saltbush, soaptree yucca, mesa dropseed. Key forage species: black grama, mesa dropseed. Productivity & suitability: see Alluvial Fans. Condition and trend: see Alluvial Fans.	Key species: smaller mammals dominate, especially Ord's kangaroo rat and the northern grasshopper mouse. Birds include dove, quail, black-throated sparrows and kingbirds, Habitat: Sand dunes and mesquite hummocks and eolian deposits. Endangered & threatened species: potential habitat for Peregrine falcon, Texas lyre snake, former Aplomado falcon habitat.	Historical sites: Sacramento City; ranching remains. Archaeological sites: four villages; ceramic sites are 44% of unit total. (See also Tables 2-12 and 2-13). Site locations: found in areas of small drainages and in interdune locations; average site size is 22.7 acres, excluding one unusually large site from the average. Site condition: 33.3% are in poor condition due to wind and water erosion. Land use: Access roads, fences, grazing facilities in north; secondary missile impact area; geothermal resource potential to south.

Source: field studies by Lee Wilson & Associates Inc. (1979).



NATURAL UNITS

Figure 2-1

soils, and in the case of tobosa, occur on overflow areas. Burrograss is often mixed with creosotebush or grows in a near monoculture situation.

The Rimlands is a complex ecological area with a large number of community subtypes. While the topography is similar to Canyonlands, the vegetation is the desert shrub sub-type, creosotebush-mesquite. Grass cover is high, partially because the area has not been grazed for at least 14 years. Wildfires have been common in the unit and less shrubby cover exists where these fires have occurred. The more common plant communities are: honey mesquite - alkali sacaton; whitethorn - grama - burrograss; soaptree yucca - winterfat - sideoats grama; creosotebush - tarbush- bristlegrass; and blue grama. Marestail is locally dominant in overflow areas or on disturbed sites.

On Alluvial Fans the creosotebush subtype predominates. Creosote tends to form dense stands, particularly along arroyos. Tarbush is often found downslope on finer soils. Grass cover is generally low. The more common grasses are burrograss, fluffgrass, and alkali sacaton. Annual forbs are numerous.

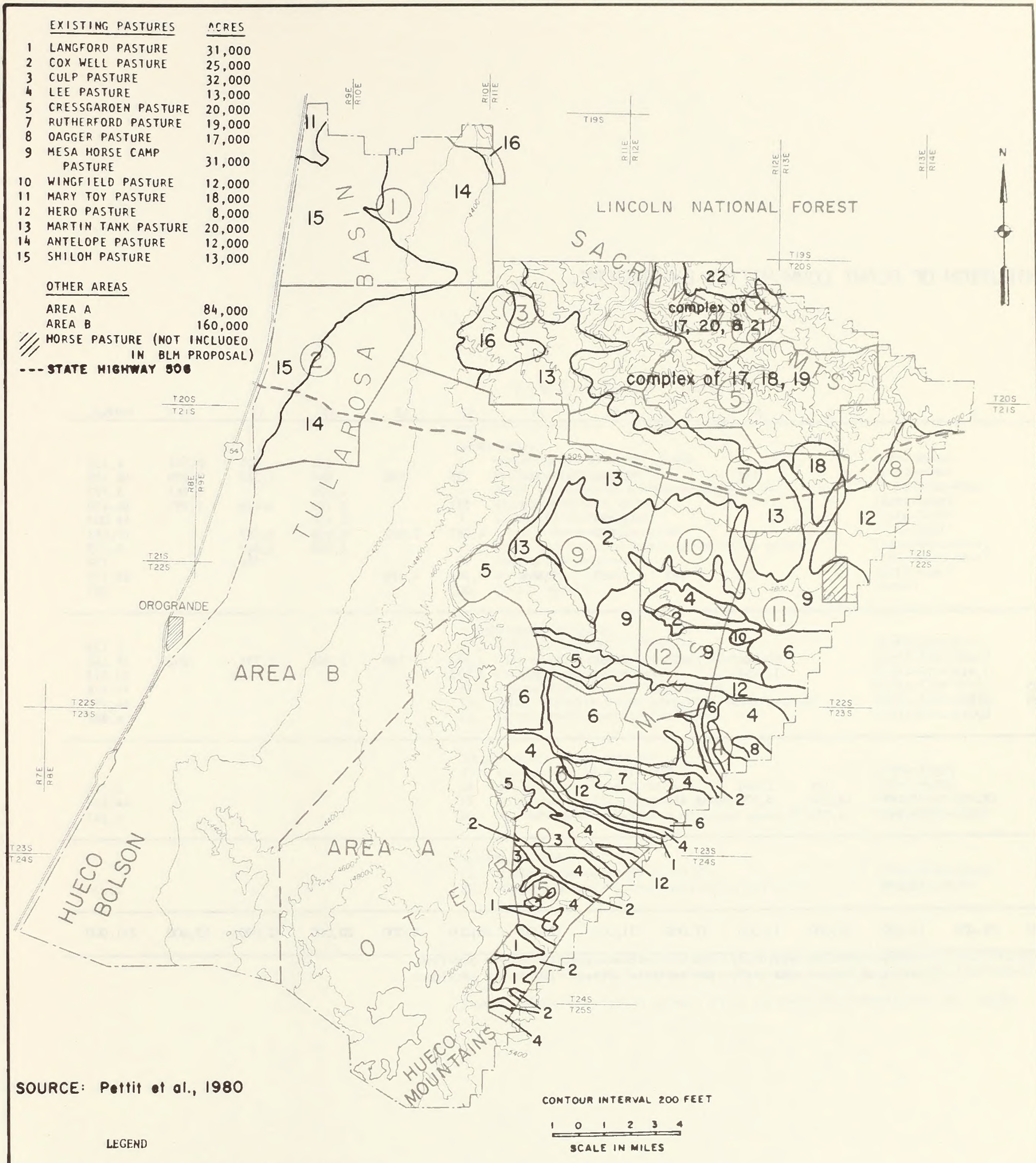
The Bolson, with its mesquite vegetation, is a fragile ecosystem, limited by scant precipitation and coarse-textured and gypsiferous soils. Honey mesquite occurs in association with coppice dunes. Interspersed throughout the dunes are islands or mixed stands of creosotebush, soaptree yucca, sand sagebrush, and four-wing saltbush. The most abundant grasses are the dropseeds. Toxic species such as desert baileya occur in areas where grazing has been heavy.

PLANT COMMUNITIES

Within the fourteen existing pastures, 45 plant communities have been mapped on color aerial photographs at a scale of 1:24,000 (1 inch = 2,000 feet). The units have been combined into 22 communities, and remapped at a scale of 1:345,600 (1 inch = 28,800 feet = 5.45 miles). Figure 2-2 is the map of the 22 plant communities. Because of the scale of the mapping, most units contain inclusions of other plant communities. The report by Pettit et al. (1980) provides information on the variations in plant composition which occur within each of the mapped units.

Table 2-2 lists the 22 plant communities and indicates their acreage by pasture. There are ten grassland communities (97,339 acres), six desert shrub communities (116,948 acres), four half-shrub communities (50,014 acres), and two woodland communities (5,799 acres). Table 2-3 provides data on the estimated herbage yield and ground cover of each community, as determined by the 1979 field studies.

The distribution of plant communities is closely related to soil groups known as range sites. The relationship of range sites to the soil-mapping units identified in this EIS is given later in Chapter 2 (see Table 2-6). Each range site has the potential to support a distinctive native plant community, which will differ from the communities on other range sites in the proportion of species present and in their potential productivity. SCS has prepared de-



LEGEND

1 Feathergrass-sideoats grama (STNE-BOCU)
2 Soaptree yucca-tobosa (YUEL-HIMU)
3 Datil yucca-broom snakeweed-black grama (YUBA-XASA-BOER)
4 Black grama-blue grama (BOER-BOGR)
5 Sacahuista-feathergrass (NOTE-STNE)
6 Broom snakeweed-blue grama (XASA-BOGR)
7 Broom snakeweed-sideoats grama-black grama (XASA-BOCU-BOER)
8 Cholla-tobosa-grama (OPIM-HIMU-BOUT)
9 Burrograss-tobosa (SCBR-HIMU)
10 Alkali sacaton (SPAI)
11 Coldenia-dogweed-fluffgrass (COHI-DYAC-ERPU)
12 Creosotebush-broom snakeweed-blue grama (LATR-XASA-BOGR)
13 Creosotebush-burrograss (LATR-SCBR)
14 Creosotebush-tarbush-burrograss (LATR-FLCE-SCBR)
15 Honey mesquite-broom snakeweed-mesa dropseed (PRGL-XASA-SPFL)
16 Creosotebush-mariola-fluffgrass (LATR-PAAR-ERPU)
17 Apacheplume-blue grama (FAPA-BOGR)
18 Goldeneye-curlyleaf muhly (VIST-MUSE)
19 Goldeneye-mariola-sideoats grama (VIST-PAAR-BOCU)
20 Mountain mahogany-curlyleaf muhly-blue grama (CEMU-MUSE-BOGR)
21 Juniper-oak-sideoats grama (JUNI-QUUN-BOCU)
22 Pinon/juniper-mountain mahogany-muhly (PJ-CEMO-MUSE)

VEGETATION COMMUNITIES

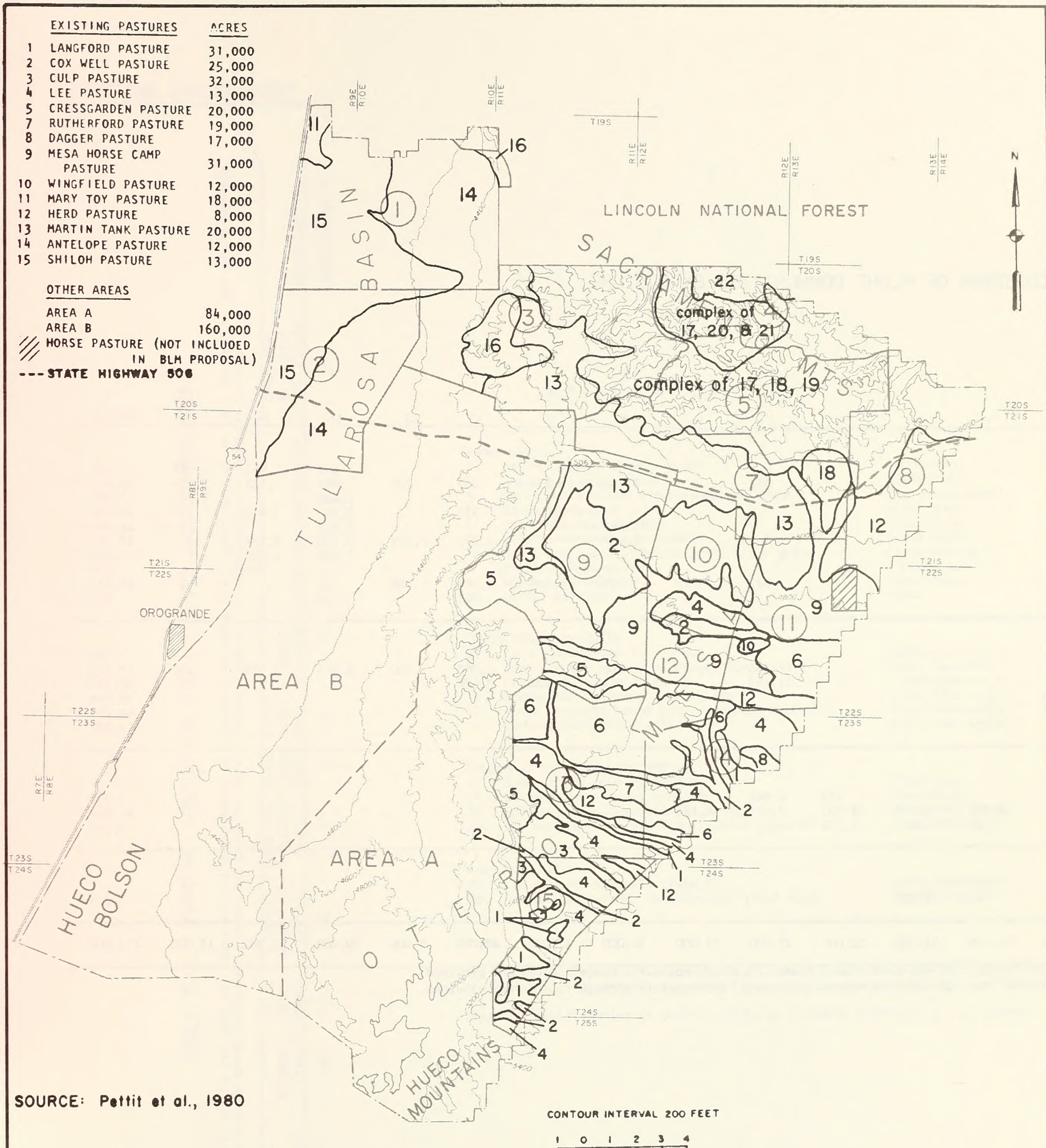
Figure 2-2

TABLE 2-2. DISTRIBUTION OF PLANT COMMUNITIES BY PASTURE.

VEGETATION UNIT		PASTURE 1	2	3	4	5	7	8	9	10	11	12	13	14	15	TOTALS
SHORT GRASS																
1. Feathergrass-sideoats grama	(Stne-Bocu)												662	913	2,587	4,162
2. Soaptree yucca-tobosa	(Yuel-Himu)						331		7,246	5,334	135	520	844	1,323	2,399	18,132
3. Datil yucca-broom snakeweed-black grama	(Yuba-Xasa-Boer)												1,626		1,767	3,393
4. Black grama-blue grama	(Boer-Bogr)									2,500	337		5,180	2,418	5,995	16,430
5. Sachuista-feathergrass	(Note-Stne)								11,593				2,410			14,003
6. Broom snakeweed-blue grama	(Xasa-Bogr)								1,829		4,787	2,602	6,446	3,787		19,451
7. Broom snakeweed-sideoats grama-black grama	(Xasa-Bocu-Boer)												1,566	1,049		2,615
8. Cholla-tobosa-gramas	(Opim-Himu-Bout)													776		776
9. Burrograss-tobosa	(Scbr-Himu)						927	393	3,465	1,944	7,349	4,098				18,176
10. Alkali sacaton	(Spai)										201					201
CREOSOTEBUSH-MESQUITE																
11. Coldenia-dogweed-fluffgrass	(Cohi-Oyac-Erpu)	1,122														1,122
12. Creosotebush-broom snakeweed-blue grama	(Latr-Xasa-Bogr)						66	12,423	1,386		1,753	780	1.266	1,734	252	19,660
13 Creosotebush-burrograss	(Latr-Scbr)			7,919			11,453		5,481	2,222	3,438					30,513
14. Creosotebush-tarbush-burrograss	(Latr-Flce-Scbr)	6,411	10,105													16,516
15. Honey mesquite-broom snakeweed-mesa dropseed	(Prgl-Xasa-Spfl)	22,739	14,895	6,621												44,255
16. Creosotebush-mariola-fluffgrass	(Latr-Paar-Erpu)	728		4,154												4,882
GOLDENEYE-MOUNTAIN MAHOGANY																
17. Apacheplume-blue grama a b/	(Fapa-Bogr)															
18. Goldeneye-curlyleaf muhly a/	(Vist-Muse)					124	2,648									2,772
19. Goldeneye-mariola-sideoats grama a/	(Vist-Paar-Bocu)			13,306	5,299	18,500	3,575	4,184								44,864
20. Mt. mahogany-curlyleaf muhly-blue grama b/	(Cemo-Muse-Bogr)				4,867	1,376										6,243
PINYON-JUNIPER																
21. Juniper-oak-sideoats grama b/	(Juni-Quun-Bocu)															
22. Pinyon juniper-Mt. mahogany-curlyleaf muhly	(PJ-Cemo-Muse)				2,834											2,834
TOTALS		31,000	25,000	32,000	13,000	20,000	19,000	17,000	31,000	12,000	18,000	8,000	20,000	12,000	13,000	271,000

a. Units 17, 18, and 19 were mapped as a complex in some pastures. Data are reported for unit 19. Unit 17 was also mapped separately, and separate acreage figures are provided.
b Units 17, 20, and 21 were mapped as a complex in some pastures. Data are reported for unit 20. Unit 17 was also mapped separately, and separate acreage figures are provided.

Source: Field studies in Summer, 1979, as reported in Pettit et. al. (1980).



LEGEND

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19	Goldeneye-mariola-sideoats grama	(VIST-PAAR-BOCU)
20	Mountain mahogany-curlyleaf muhly-blue grama	(CEMU-MUSE-BOGR)
21	Juniper-oak-sideoats grama	(JUNI-QUUN-BOCU)
22	Pinon/juniper-mountain mahogany-muhly	(PJ-CEMO-MUSE)

VEGETATION COMMUNITIES

Figure 2-2

TABLE 2-2. DISTRIBUTION OF PLANT COMMUNITIES BY PASTURE.

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20. Mt. mahogany-curlyleaf muhly-blue grama b/	(Cemo-Muse-Bogr)				4,867	1,376										6,243
PINYON-JUNIPER																
21. Juniper-oak-sideoats grama b/	(Juni-Quun-Bocu)															
22. Pinyon juniper-Mt. mahogany-curlyleaf muhly	(PJ-Cemo-Muse)				2,834											2,834
TOTALS		31,000	25,000	32,000	13,000	20,000	19,000	17,000	31,000	12,000	18,000	8,000	20,000	12,000	13,000	271,000

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b Units 17, 20, and 21 were mapped as a complex in some pastures. Data are reported for unit 20. Unit 17 was also mapped separately, and separate acreage figures are provided.

Source: Field studies in Summer, 1979, as reported in Pettit et. al. (1980).

TABLE 2-3. TYPICAL VEGETATION YIELD, COVER AND COMPOSITION.

Herbage yields (in pounds per acre per year) reflect adjustments as described in Table C-2. Cover data given as a percent of the ground surface. Dominant species include those in community name, and those in "other" column. See key for explanation of dominant species.

Plant Community	Herbage Yield	Cover Bare Ground	Cover Persistent Litter	Cover Non-Persistent Litter	Cover Large Rock	Cover Small Rock	Cover Plants	Other Dominant Species	Dominants as Percent of all Plants	Range Site
1. Stne-Bocu	722	40	4	3	8	36	19	Boer, Muse, Xasa	65	Limestone Hills
2. Yuel-Himu	1,122	32	3	35	0	0	30	Bogr, Pena, Ambr	60	Draw
3. Yuba-Xasa-Boer	698	63	9	15	2	2	9	Spcr, Bogr	69	Shallow Sandy
4. Boer-Bogr	790	57	5	13	2	7	23	Leer, Xasa	52	Shallow Sandy
5. Note-Stne	515	70	1	6	4	12	7	Lepi	53	Limestone Hills
6. Xasa-Bogr	668	54	4	15	1	8	23	Boer	80	Shallow Sandy
7. Xasa-Bocu-Boer	480	63	9	15	2	2	9	Scbr, Lesq	59	Shallow Sandy
8. Oplm-Himu-Bout	1,354	48	18	16	0	0	18	Spha, Scbr, Crot	63	Draw
9. Scbr-Himu	409	72	4	9	0	1	14	Bogr, Saxa, Paob	57	Draw
10. Spai	1,213	51	1	36	4	3	11	Bogr, Himu	68	Lmy
11. Cohl-Dyac-Erpu	432	5	1	1	16	22	55	Lepi	34	Gyp, Loamy
12. Latr-Xasa-Bogr	472	39	0	6	1	30	11	Scbr, Lesq	57	Shallow Sandy
13. Latr-Scbr	454	66	3	18	1	2	21	Himu, Lepi	65	Gravelly
14. Latr-Flce-Scbr	350	63	3	9	0	1	21	Lepi, Xasa	58	Gravelly, Loamy
15. Prgl-Xasa-Spfl	590	64	7	7	0	0	22	Bamu, Twinpod	51	Deep Sand
16. Latr-Paar-Erpu	158	38	5	8	7	37	5	Aris, Lesq, Fosp, Cohl, Dyac	65	Limestone Hills
17. Fapa-Bogr	1,697	42	5	33	1	5	14	Muas, Spcr	63	Unknown
18. Vist-Muse	741	12	6	7	36	32	7	Bocu, Trmu, Linum	58	Limestone Hills
19. Vist-Paar-Bocu	615	2	7	7	34	40	54	Allium, Lyph	38	Limestone Hills
20. Cemo-Muse-Bogr	710	16	5	14	30	26	9	Bocu, Allium, Pled	72	Limestone Hills
21. Junl-Quun-Bocu	810	17	19	10	17	25	12	Bogr, Rhar	60	Limestone Hills
22. PJ-Cemo-Muse	620	21	11	14	16	15	23	Bocu, Bohl	62	Limestone Hills

Key to dominant species (see also Table C-2). Ambr = ambrosia; Aris = threeawn; Bamu = desert baileya; Bocu = sideoats grama; Boer = black grama; Bogr = blue grama; Bohl = hairy grama; Bout = grama, general; Cemo = mountain mahogany; Cohl = coldenia; Crot = doveweed; Dyac = prickleaf dogweed; Erpu = fluffgrass; Fapa = apacheplume; Flce = tarbush; Fosp = ocatillo; Himu = tobosa; Junl = juniper; Latr = creosotebush; Leer = baby white aster; Lepi = pepperweed; Lesq = bladderpod; Lyph = wolftail; Muas = alkalai muhly; Muse = Curlyleaf muhly; Note = sacahuista; Oplm = cholla; Paar = mariola; Paob = vine mesquite; Pena = desert holly; Pled = pinyon; Prgl = honey mesquite; PJ = pinyon-juniper; Quun = wavyleaf oak; Rhar = skunkbush; Saka = Russian thistle; Scbr = burrograss; Spai = alkali sacaton; Spcr = sand dropseed; Spfl = mesa dropseed; Spha = mallow; Stne = New Mexico feathergrass; Trmu = slim tridens; Vist = goldeneye; Xasa = broom snakeweed; Yuba = banana yucca; Yuel = soaptree yucca.

Source: Field studies in Summer, 1979, as reported in Pettit et. al. (1980).

scriptions and evaluations of the range sites in Otero County. Because the SCS guide is incomplete at this time, only a partial correlation can be made between the range sites and plant communities on McGregor Range. Table 2-3 identifies the general relationship between the communities mapped in Figure 2-2 and the range sites identified in Table 2-6.

UTILIZATION OF FORAGE

The 1979 field studies included an evaluation of the extent to which forage resources (key and other species) are presently utilized on McGregor Range. No distinction was made between wildlife and domestic animal use. Figure 2-3 is a map showing the degree of utilization in different parts of the fourteen pastures. The acreage in each utilization category is summarized in Table 2-4, by pasture. The table also indicates the relationship between quantitative and qualitative measures of utilization.

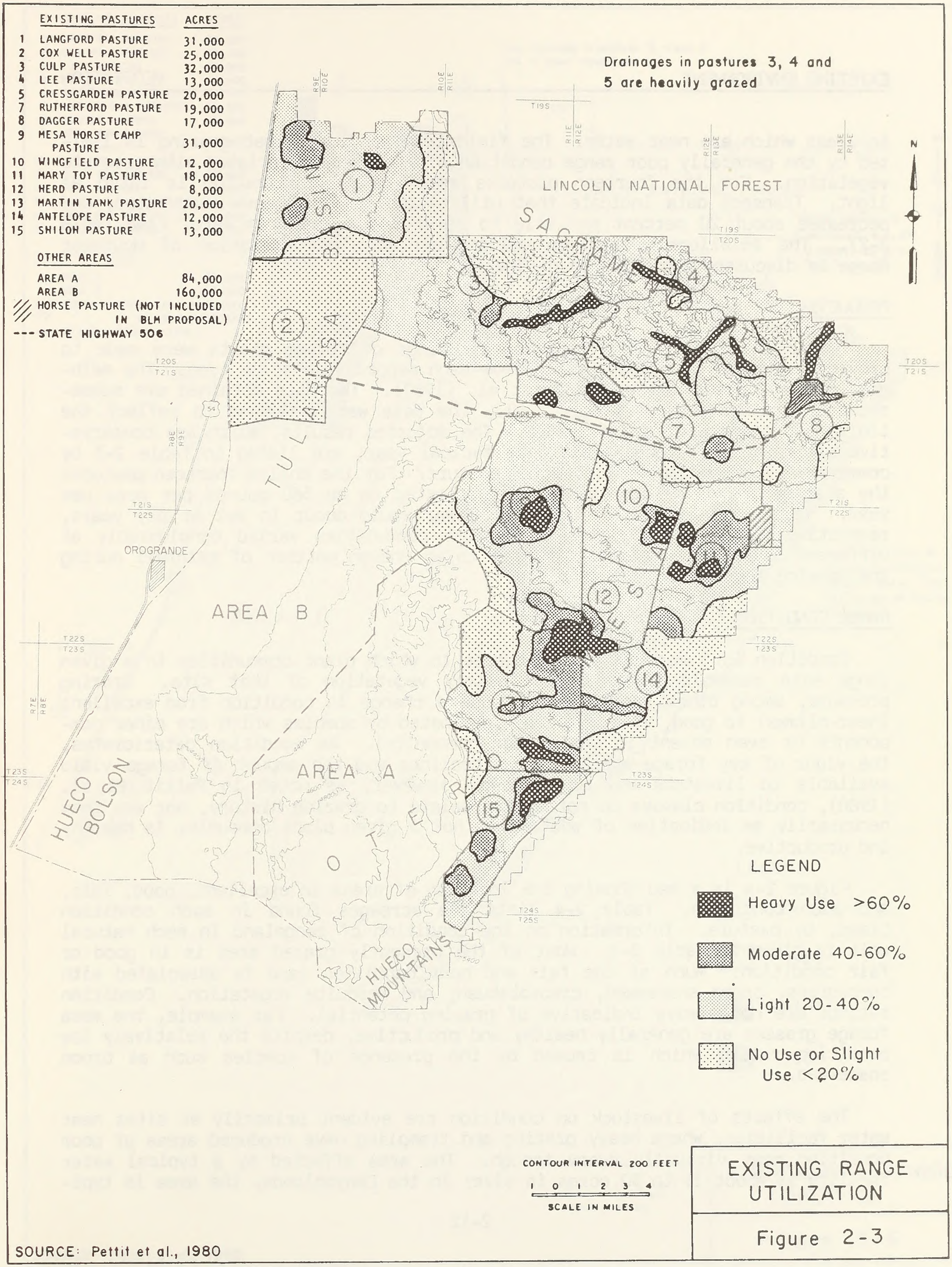
As shown on the Figure, areas of heavy utilization are limited in extent. These areas occur primarily near watering facilities and along the drainage ways of the Canyonlands natural unit. Not all such areas are large enough to appear in Figure 2-3, and are therefore not included in Table 2-4. Many portions of the existing pastures have light or slight utilization, especially near pasture boundaries at distances greater than 2 miles from water, and in steeply sloping or inaccessible locations. In Pasture 7, utilization is light

TABLE 2-4. RANGE UTILIZATION AND CONDITION, BY PASTURE.

Values equal the number of acres in each pasture which fall within a given utilization or condition category. Utilization classes are: severe (or sacrifice) = more than 80%; heavy = 60-80%; moderate = 40-60%; light = 20-40%; slight - less than 20%. Condition classes are related to species composition, expressed as a percent of the present climax vegetation: excellent = 76-100%; good = 51-75%; fair = 26-50%; poor = 0-25%. Values do not reflect local increases of utilization near water and in small canyons, and the generally poor condition of land in such areas.

Pasture,	Acres	UTILIZATION Heavy	UTILIZATION Moderate	UTILIZATION Light	UTILIZATION Slight	CONDITION Excellent	CONDITION Good	CONDITION Fair	CONDITION Poor
1.	31,000	310	1,860	18,910	9,920	0	0	26,660	4,430
2.	25,000	0	0	0	25,000	0	14,250	10,750	0
3.	32,000	960	640	21,760	8,640	0	19,840	8,640	3,520
4.	13,000	520	0	11,570	910	0	11,830	0	1,170
5.	20,000	1,400	0	11,800	6,800	0	19,800	0	200
7.	19,000	950	570	15,960	1,520	0	6,460	10,450	2,090
8.	17,000	1,020	850	14,110	1,020	0	10,370	6,630	0
9.	31,000	1,240	3,410	22,940	3,410	0	6,200	22,320	2,480
10.	12,000	480	480	10,560	480	0	720	11,280	0
11.	18,000	1,080	4,320	10,980	1,620	1,080	1,800	12,240	2,880
12.	8,000	880	320	6,800	0	0	320	7,040	640
13.	20,000	1,600	4,200	10,000	4,200	0	11,800	7,000	1,200
14.	12,000	0	480	4,920	6,600	5,520	5,400	1,080	0
15.	13,000	910	2,080	6,750	3,260	1,430	10,920	650	0

Source: field studies in Summer, 1979, as reported in Pettit et. al. (1980).



EXISTING RANGE UTILIZATION

Figure 2-3

in areas which are near water. The field team concluded that grazing is limited by the generally poor range condition of the area, associated with creosote vegetation. For the fourteen pastures as a whole, utilization is rated as light. Transect data indicate that utilization is very heavy near water, and decreases about 20 percent per mile to zero at 3 miles from water (see Table 3-2). The relationship between utilization and the vegetation of McGregor Range is discussed beginning on p. 3-4.

PRODUCTIVITY

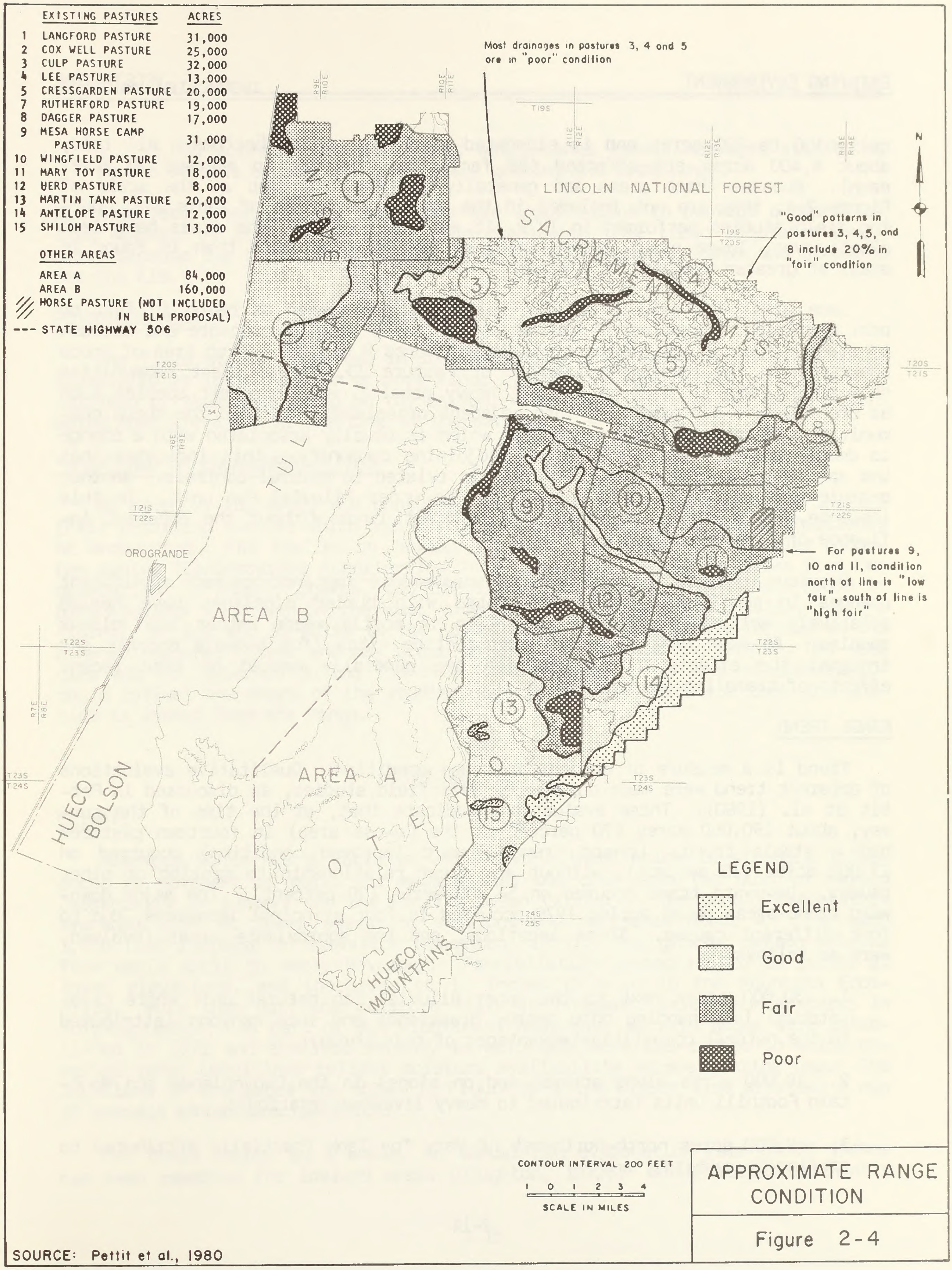
During the field investigations, clippings of forage plants were made to provide estimates of herbage yield from each mapped vegetation type. The methods used are described in Pettit et al. (1980). The data obtained are summarized in the Appendix C (Table C-2). The data were adjusted to reflect the timing and scope of the field work. The adjusted results, which are conservative estimates of herbage yield in a typical year, are listed in Table 2-3 by community type, and in Table 3-3, by pasture. For the entire fourteen pastures the average annual herbage yield was estimated to be 560 pounds per acre per year. Values substantially higher or lower would occur in wet or dry years, respectively. In 1979, yields from given communities varied considerably at different sites, due at least in part to an uneven pattern of rainfall during the growing season.

RANGE CONDITION

Condition is a measure of the degree to which plant communities in a given range site resemble the potential climax vegetation of that site. Grazing pressure, among other factors, can cause a change in condition from excellent (near-climax) to good, fair, or poor (dominated by species which are minor components or even absent in the climax community). As condition deteriorates, the vigor of key forage species often declines and the amount of forage yield available to livestock may be reduced. However, as noted in Pettit et al. (1980), condition classes do not always relate to grazing history, nor are they necessarily an indication of whether or not a given plant community is healthy and productive.

Figure 2-4 is a map showing the location of areas in excellent, good, fair, and poor condition. Table 2-4 lists the acreages found in each condition class, by pasture. Information on the condition of rangeland in each natural unit is given in Table 2-1. Most of the presently grazed area is in good or fair condition. Much of the fair and poor condition land is associated with burrograss, broom snakeweed, creosotebush, and mesquite vegetation. Condition ratings are not always indicative of grazing potential. For example, the mesa forage grasses are generally healthy and productive, despite the relatively low condition rating which is caused by the presence of species such as broom snakeweed.

The effects of livestock on condition are evident primarily at sites near water facilities, where heavy grazing and trampling have produced areas of poor condition near virtually every trough. The area affected by a typical water facility is about 25 to 50 acres in size; in the Canyonlands, the area is typi-



APPROXIMATE RANGE CONDITION

Figure 2-4

cally 100 to 200 acres and is elongated along the valley bottoms. All told, about 4,400 acres are affected (88 facilities, assumed to average 50 acres each). Because these areas are generally too small to map at the scale of Figure 2-4, they are not included in the acreage estimates of Table 2-4. During field studies performed in 1979, it was observed that the areas have less plant cover, lower plant vigor, and less herbage production than is found in areas at greater distance from water.

Some areas not associated with water are also rated as being in fair or poor condition. Examples of such areas include a band of creosote and tarbush on steep slopes in the southern part of Pastures 9 and 12, and an area of broom snakeweed in the northwest quadrant of Pasture 13. These plant communities show no evidence of past or present heavy grazing, and increaser species such as creosote are not expanding into adjacent grasslands. Instead the shrub communities have a fairly sharp boundary which is usually associated with a change to deeper and/or finer soils in the adjoining community. This indicates that the species composition in these areas is related to natural controls. Another example occurs both north and south of the upper Alluvial Fan unit. In this instance, creosote is expanding onto adjacent lands without the apparent influence of livestock grazing.

Previous construction of range improvements has not caused significant changes in condition. Scars associated with buried pipelines have healed relatively well, although the vegetation is mostly weeds rather than climax species. At most other previous construction sites (for example corrals and troughs) the effects of construction are generally masked by more recent effects of trampling and grazing.

RANGE TREND

Trend is a measure of changes in range condition. Qualitative evaluations of apparent trend were made during the 1979 field studies, as discussed in Pettit et al. (1980). These evaluations indicate that, at the time of the survey, about 190,000 acres (70 percent of the Co-use area) in fourteen pastures had a stable trend. Upward trend (toward improved condition) occurred on 27,000 acres (10 percent), without any clear relationship to grazing or other causes. Downward trend occured on 54,000 acres (20 percent). The major downward trend areas noted during 1979 occurred in four principal locations, due to four different causes. These locations, and the approximate areas involved, were as follows:

1. 30,000 acres next to the upper Alluvial Fan natural unit where creosotebush is expanding onto nearby grasslands and into canyons (attributed to the natural competitive advantages of this shrub);

2. 10,000 acres along arroyos and on slopes in the Canyonlands and Mountain Foothill units (attributed to heavy livestock grazing);

3. 9,000 acres north-northwest of Mary Toy Tank (partially attributed to grazing by rabbits); and

4. 5,000 acres around most other water tanks (small acreages attributed to the efforts of concentrated cattle grazing and trampling).

BLM data from trend plots on the Range are insufficient to provide a quantitative measure of trend, but support the conclusion that trend is stable overall. Because the trend evaluation is generalized, no map or table was prepared for the EIS.

POISONOUS PLANTS

The field studies resulted in identification of 20 plant species which are classified as toxic for one or more kinds of animals (see Pettit et al. 1980). Thirteen of these are found on the Bolson, with desert baileya and garbanocillo being most prevalent at the time of the survey.

THREATENED OR ENDANGERED PLANTS

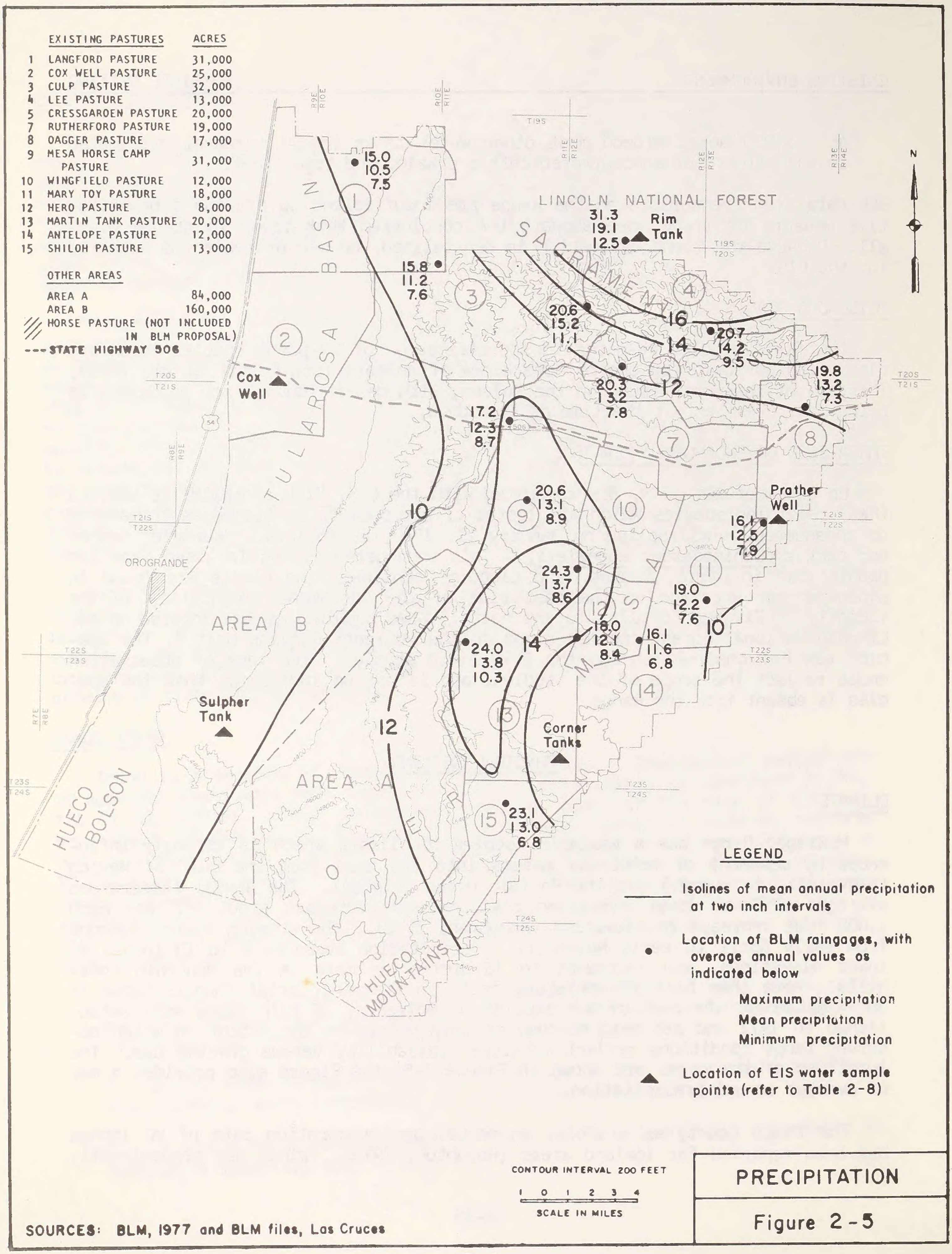
On December 20, 1979, BLM consulted with the U.S. Fish and Wildlife Service (FWS) regarding species which are listed or proposed to be listed as threatened or endangered. FWS replied on January 11, 1980, as follows. "Kuenzler hedgehog cactus (Echinocereus kuenzleri) - This endangered cactus is known from two populations in Otero, Chaves, and Lincoln Counties. The plants are found in pinon-juniper woodland on the east side of the Sacramento Mountains, in the vicinity of Elk and 50 miles to the north. Some populations are located on the Lincoln National Forest and may occur in the McGregor Grazing Unit." The species was not observed during the 1979 field studies. The lack of observation could reflect the scope of the studies, and is not an indication that the species is absent from the Range.

PHYSICAL SETTING

CLIMATE

McGregor Range has a variable, semi-arid climate which is strongly influenced by movement of moist air masses into the area from the Gulf of Mexico (especially in summer) and the Pacific Ocean (winter). The annual temperature averages 62°F at lower elevation stations and decreases about 4°F for each 1,000 foot increase in elevation (Houghton, 1972). The growing season extends from early April to early November. Precipitation averages 8 to 10 inches at lower elevations, and increases to 16 inches or more in the Mountain Foothills. More than half the moisture falls in frequent, brief thunderstorms in July-September. As part of BLM studies of McGregor, 16 rain gages were established in 1971 and are read monthly to help determine the extent to which observed range conditions reflect moisture availability versus grazing use. The locations of the gages are shown in Figure 2-5; the Figure also provides a map of average annual precipitation.

For Otero County as a whole, an annual pan evaporation rate of 90 inches has been reported for lowland areas (Houghton, 1972). Winds are predominantly



PRECIPITATION

Figure 2-5

from the west, southwest or south with velocities which average 10 miles per hour (DOA, 1976). Stronger winds (to 30 mph or more) are common, especially in spring when dust storms are frequent.

AIR QUALITY

Because of a lack of significant air pollution sources, the quality of the air space above the range is good (DOA, 1976). However, Federal and State air quality standards are violated for total suspended particulates (TSP), ozone and hydrocarbons. The ozone and hydrocarbon problems are attributed to urban pollution in El Paso, Juarez, and Las Cruces (DOA, 1976). An evaluation of probable sources and levels of TSP within the Co-use area is presented in Wilson (1980). Of a total measurable TSP emission of 68,391 tons per year, 90 percent comes from wind erosion of rangeland. The remainder is road dust and smoke from range fires. The estimated annual average TSP concentration on the Range is 100 micrograms per cubic meter, which exceeds Federal standards of 75 and State standards of 60 micrograms per cubic meter. The high average reflects the influence of dust storms; standards are generally met during periods when wind-erosion effects are absent.

NOISE

Noise levels on McGregor Range are low (less than 40 decibals, A-scale (dBA)) at nearly all times (DOA, 1976). Existing sources of significant noise on the Range relate mostly to military activity. A study of military noise sources found that missile firings were undetectable on Otero Mesa except for errant missiles that reached the area (DOA, 1976). Aircraft noise is detectable on the Mesa, but no disturbance in antelope grazing patterns occurs from normal operations. Low overflights (300 feet) produce ground-level noise of 92 dBA, which does affect wildlife. Non-military sources of noise within the Co-use area include weapons firings during hunting seasons, and traffic on State Highway 506.

GEOLOGY

The western half of the Range is underlain by unconsolidated to poorly consolidated clays, sands, and gravels which make up the basin-fill sediments of the Tularosa Basin. The eastern portion of the Range is underlain by consolidated sedimentary rocks, including limestones, shales, sandstone, and gypsum. Although potential geologic resources occur, no economic development has been undertaken. Table 2-1 provides information on the geology of each natural unit.

TOPOGRAPHY

The prominent topographic features of McGregor Range are: the Sacramento Mountains; Otero Mesa; the Hueco Mountains; and the Tularosa and Hueco Basins (Figure 2-1). The mountains and mesa represent the upland portion of the Range, while the basins are the lowlands. Information on the topography of each natural unit is presented in Table 2-1.

SOILS

SOIL TYPES AND PROPERTIES

The soils of McGregor Range are closely related to the natural units. Thin, stony soils predominate in the Mountain Foothills, Canyonlands, and Rimlands and are generally associated with rock outcrops. Soils of the Mesa range from thin and loamy, over caliche or bedrock, to deep and loamy. (Technical terms such as caliche are defined in the glossary.) Soils in the Alluvial Fans and Bolson units are generally loamy or sandy, depending on geologic and topographic setting. These relationships are described in more detail in Table 2-1.

To help evaluate the relationship of soils to other environmental resources (especially vegetation), a third-order-survey map of soil series and associations was prepared for the fourteen pastures during the 1979 field season. A page-size version of the map is presented as Figure 2-6. A more detailed soils map is available for review in a report by Allen and Anderson (1980), which is on file at the BLM Las Cruces District Office. The map is based on unpublished aerial photo maps prepared by the U.S. Soil Conservation Service (SCS) for use in the Otero County soils survey (SCS, in preparation). Minor modifications in boundary locations and mapping unit designations were made while checking the maps as part of the field study phase of EIS preparation.

Where an individual soil series is predominant over a sufficiently large area to be separately mapped, it has been used as the mapping unit on Figure 2-6. Where soil series (or land subtypes) occur in consistent relationships to one another, they have been grouped into soil associations, and mapped as a unit. Where the series (or land subtypes) occur in such an intricate pattern that they cannot be separated at the scale used, the series have been mapped as complexes. The acreage of soil mapping units in each pasture is given in Table 2-5. The percent of different soil series in each unit is also indicated as a percent of the unit. Brief descriptions of the mapping units, as observed in the fourteen pastures, are presented in Table 2-1 by natural unit.

SCS has compiled extensive information on the properties of the individual soil series. This information has been field checked and verified for the EIS at selected sites within the existing fourteen pastures. A discussion of field methods is contained in the report by Allen and Anderson (1980). Table 2-6 summarizes information on the properties of the major soil series which occur in the area. For purposes of the EIS, the range of properties has been expanded for some series.

EROSION RATES

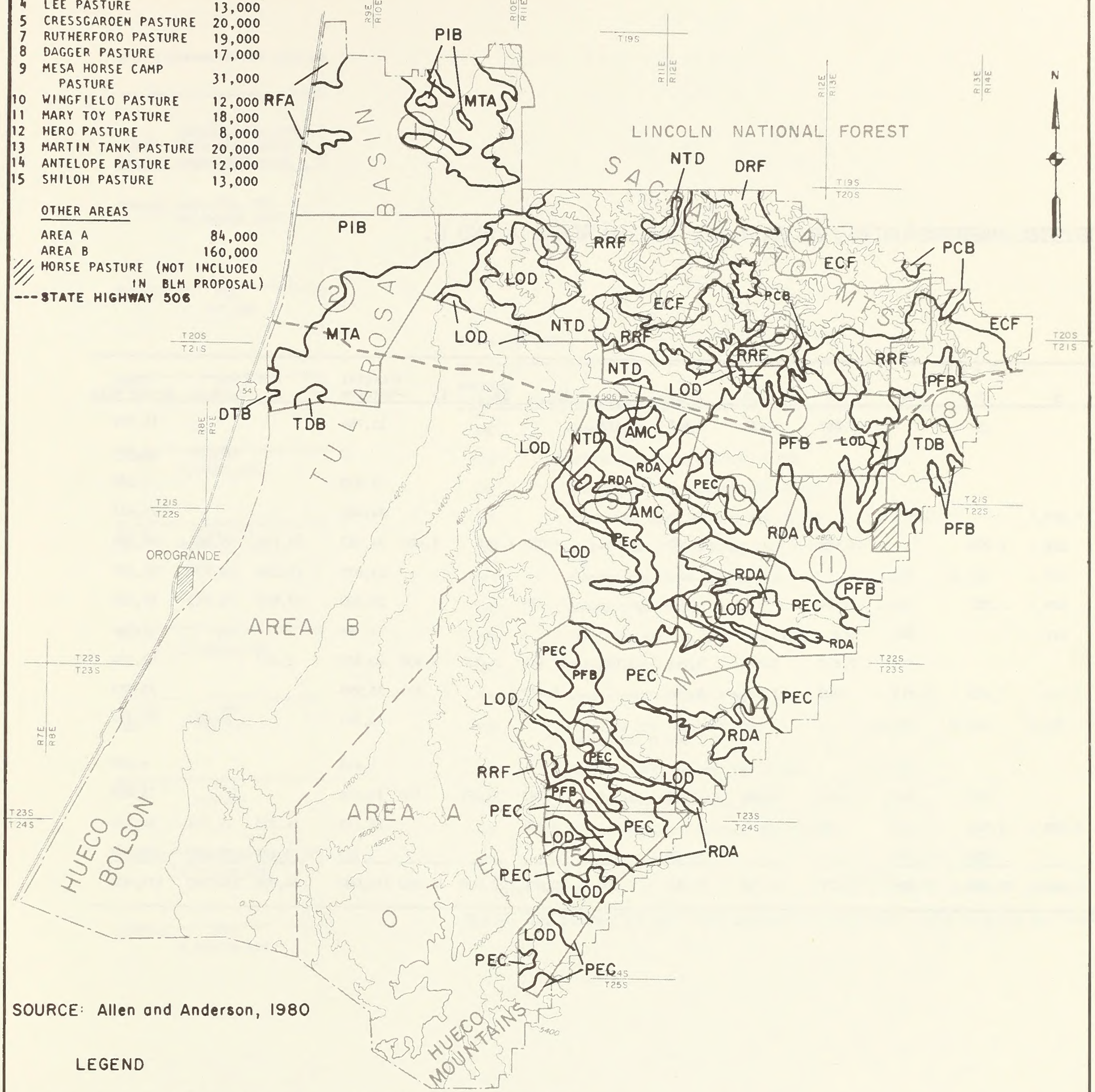
Wind and water erosion are the most significant processes presently affecting the soils of McGregor Range. Estimates of the rate of wind erosion under current conditions have been made using the Wind Erosion Equation. The methodology and results are given in Allen and Anderson (1980) and summarized in Appendix D (Table D-1). The estimated erosion rates are summarized by natural unit in Table 2-1. Three units are considered to have no significant wind ero-

EXISTING PASTURES		ACRES
1	LANGFORD PASTURE	31,000
2	COX WELL PASTURE	25,000
3	CULP PASTURE	32,000
4	LEE PASTURE	13,000
5	CRESSGAROEN PASTURE	20,000
7	RUTHERFORO PASTURE	19,000
8	DAGGER PASTURE	17,000
9	MESA HORSE CAMP PASTURE	31,000
10	WINGFIELO PASTURE	12,000
11	MARY TOY PASTURE	18,000
12	HERO PASTURE	8,000
13	MARTIN TANK PASTURE	20,000
14	ANTELOPE PASTURE	12,000
15	SHILOH PASTURE	13,000

OTHER AREAS	ACRES
AREA A	84,000
AREA B	160,000

HORSE PASTURE (NOT INCLUOEO IN BLM PROPOSAL)

--- STATE HIGHWAY 506



SOURCE: Allen and Anderson, 1980

LEGEND

AMC	Armeso very fine sandy loam, 0 to 5 percent slopes
DTB	Dona Ano-Berino association, gently sloping
DRF	Deama-Rock outcrop complex, 20 to 50 percent slopes
ECF	Ector-Rock outcrop complex, 20 to 50 percent slopes
LOD	Lozier-Rock outcrop complex, 11 to 20 percent slopes
MTA	Mimbres-Tome association, nearly level
NTD	Nickel-Tencee association, strongly sloping
PCB	Pena-Cale-Kerrick association, nearly level
PEC	Philder very fine sandy loam, 0 to 9 percent slopes
PFB	Philder-Armeso association, unduloting
PIB	Pintura-Dona Ana-Tome complex, 0 to 5 percent slopes
RFA	Reeves-Holloman association, nearly level
RDA	Reyab-Armesa association, gently sloping
RRF	Rock outcrop-Lozier complex, 20 to 65 percent slopes
TDB	Tome silt loam, 0 to 5 percent slopes

CONTOUR INTERVAL 200 FEET

1 0 1 2 3 4

SCALE IN MILES

SOIL MAPPING UNITS

Figure 2-6

TABLE 2-5. ACREAGE DISTRIBUTION OF SOIL MAPPING UNITS, BY PASTURE, AND IN AREAS A AND B.

O = other soils.

Mapping Unit	Component Soil Series	PASTURE 1	2	3	4	5	7	8	9	10	11	12	13	14	15	Subtotal Pastures	AREA A	AREA B	Total Co-use Area
AMC	Armesa 85%; O 15%						219		8,862	1,436	615	652				11,784			11,784
DTB	Berino 35%; Dona Ana 40%; O 25%															0		3,004	3,004
DRF	Deama 65%; Rock Outcrop 25%; O 10%				1,830											1,830			1,830
ECF	Ector 60%; Rock Outcrop 25%; O 15%			3,634	10,027	9,053		1,919								24,633			24,633
LOO	Lozier 75%; Rock Outcrop 15%; O 10%		671	6,192		211	1,900		12,499		385	1,854	4,032	1,143	5,680	34,567	34,954	19,064	88,585
MTA	Mimbres 45%; Tome 40%; O 15%	5,889	14,136	1,854												21,879	14,254	44,976	81,109
NTD	Nickel 50%; Tencee 35%; O 15%	4,813		8,454		526	3,983		2,224				190			20,190	15,001	24,911	60,102
PCB	Cale 25%; Kerrick 15%; Pena 30%; O 30%				242	912		240								1,394			1,394
PEC	Philder 85%; O 15%								2,613	3,894	5,346	3,949	10,444	8,202	6,409	40,857	2,147		43,004
PFB	Armesa 40%; Philder 45%; O 15%					1,333	9,463	5,313	883	3,830	9,500		3,270		401	33,993			33,993
PIB	Dona Ana 30%; Pintura 35%; Tome 20%; O 15%	12,650	15,522	2,151												30,323		25,031	55,354
RFA	Holloman 20%; Reeves 70%; O 10%	1,648														1,648			1,648
ROA	Armesa 35%; Reyab 60%; O 5%						219	548	3,884	2,840	692	1,545	762	2,655	510	13,655			13,655
RRF	Lozier 35%; Rock Outcrop 50%; O 15%			9,715	901	7,965	2,960	5,244	35				1,302			28,122	14,205	12,376	54,703
TDB	Tome 85%; O 15%		671				256	3,736			1,462					6,125	3,439	30,638	40,202
Total Acres:		25,000	31,000	32,000	13,000	20,000	19,000	17,000	31,000	12,000	18,000	8,000	20,000	12,000	13,000	271,000	84,000	160,000	515,000

Source: Unpublished SCS maps, spot checked in summer 1979; refer to Allen and Anderson (1980).

TABLE 2-6. PROPERTIES OF SOIL SERIES, AS USED IN THIS EIS.

NA = information not applicable; lt = less than. See bottom next page for key to symbols.

Soil Series	Mapping unit and acreage: grazed area/total area	MLRA	Horizon	Texture	Color	Restricting layer: depth (inches)	Characteristics of restricting layer (or substratum)	pH	Salinity (micromhos/ cm)	Slope range percent	Runoff rate	Water erosion suscept ibility	Wind erod- ability index (WEG)	Range site	Permea- bility	AWHC	Comments
Armesa	AMC, PF8, RFA 28,392/28,392	70	Surface	VFSL-L (L)	10YR 4/4 (10YR 3/4)	NA	NA	7.9-8.4	lt 2 (2)	0-5 (2)	med.	0.32	3	Limey	moderate	moderately raoid	calcareous throughout
			Sub surface	SCL (L)	10YR 4/4 (7.5YR 4/4)	15-17	very pale brown CL with secondary caliche	7.9-8.4	lt 2	NA	NA	0.37	NA	NA	NA	NA	
8erino	OT8 0/1,051	42	Surface	LFS-SCL (FSL)	7.5YR 4/4 (5YR 3/4)	NA	NA	6.6-7.8	lt 2	1-3 (3)	very slow	0.17	2	Loamy	moderate	moderate	noncalcareous above subsoil
			Sub surface	SCL (SCL)	5YR 46 (5YR 46)	(20)	pink, weakly cemented SCL caliche	7.4-8.4	lt 2	NA	NA	0.32	NA	NA	NA	NA	
Cale	PC8 349/349	39	Surface	SiL-L (CL)	10YR 3/2 (7.5YR 3/2)	NA	NA	7.4-8.4	none	0-5 (5)	med.	0.32	6	Loamy	moderate	high	deep and calcareous
			Sub-surface	SiCL-CL (C)	10YR 3/3 (7.5YR 3/3)	none	light brown CL or L	7.4-8.4	lt 2	NA	NA	0.37	NA	NA	NA	NA	
Oeama	DRF 1,190/1,190	39	Surface	VSTL-CL	10YR 3/2	NA	NA	7.6-8.4	lt 2	20-50	rapid	0.28	8	Limestone hills	moderate	low	calcareous; many coarse fragments some bedrock fractures
			Sub-surface	VGr-L-VSTCL	10YR 3/2	10-18	bedrock may replace subsoil	7.9-8.4	lt 2	NA	NA listed	none	NA	NA	NA	NA	
Dona Ana	OT8, PI8 9,097/17,808	42	Surface	FSL (LFS)	5YR 4/4 (5YR 4/6)	NA	NA	7.4-7.8	lt 2	0-5 (lt 1)	med.	0.11	3	Sandy	moderate	moderate	some soils cal-careous throughout; others non-cal-careous in upper horizons
			Sub surface	SCL (FSL)	5YR 4/4 (5YR 4/4)	none	some soils have moderately ce-mented caliche	7.9-8.4	2-4	NA	NA	0.32	NA	NA	NA	NA	
Ector	ECF 14,780/14,780	39-70	Surface	GrL-VGrL (GrL)	10YR 3/2 (10YR 2/2)	NA	NA	7.9-8.4	negligible	0-40 (20-40)	raoid	0.28	8	Limestone hills	moderate	low to very low	calcareous; bed-rock fractures
			Sub-surface	VGrL-CL (GrCL)	(7.5YR 3/2	4-20 (9-14)	bedrock	7.9-8.4	negligible	NA	NA	none	NA	NA	NA	NA	
Hollo-man	RDA 330/330	42	Surface	L-VFSL (FSL)	10YR 5/3 (7.5YR 5/3)	NA	NA	7.4-8.4	4-16	0-3 (lt 1)		0.49	4L	Gyp	moderate	very low	very thin surface horizon (1-4")
			Sub surface	L (L)	10YR 7/3 (7.5YR 8/3)	9 (4)	massive gypsite	none listed	none listed	NA	NA	none listed	NA	NA	NA	NA	
Kerrick	PC8 209/209	39	Surface	L-SiL (L)	10YR 3/2 (10YR 2/2)	NA	NA	7.9-3.4	-	0-5 (8)	slow	0.32	5	Limestone hills	moderate	low	calcareous throughout; moderately deep
			Sub-surface	CL-SiL (CL)	10YR 5/2 (7.5YR 4/4)	31 (12)	petrocalcic	7.9-8.4	-	NA	NA	0.32	NA	NA	NA	NA	
Lozier	LOD, RRF 35,767/85,585	42	Surface	GrL (VGrL)	10YR 5/3 (10YR 4/3)	NA	NA	7.9-8.4	negligible	1-30 (12-55)	med. to rapid	0.28	8	Limestone hills	moderate	low to very low	calcarecus; sub-ject to gullying if disturbed
			Sub-surface	VGrL-SiCL (VGrL)	(10YR 3/4, 4/4, 5/3	8 (5-13)	bedrock	7.9-8.4	negligible	NA	NA	not described	NA .	NA	NA	NA	
Mimbres	MTA 9,846/36,499	42	Surface	SiCL-VFSL (SiL)	10YR 3/4 (10YR 3/4)	NA	NA	7.9-8.4	lt 4	0-5 (lt 1)	med.	0.43	6	Loamy	moderate slow	high	soils encountered in field did not fit Mimbres defi-nitions. Oetail-ed reevaluations were not perform-ed. Figure 2-6 and Tables 2-1 and 2-5 have not been revised.
			Sub-surface	SiCL-CL (SiCL)	10YR 3/4 (7.5YR 4/4)	none	light brown SiCL with weak calcic horizon	7.9-8.4	lt 4	NA	NA	0.43	NA	NA	NA	NA	
Nickel	NTO 10,094/30,051	42,70	Surface	GrSL-GrL (VGrSL)	10YR 4/3 (7.5YR 4/4)	NA	NA	7.9-9.0	lt 2	1-30 (4-9)	med.	0.17	5	Gravelly	moderate rapid	low due to gravel	strongly calcar-eous throughout; may be very gravelly at depth
			Sub-surface	GrSL (VGrL)	7.5YR 4/3 (7.5YR 5/4)	none (8-15)	VGL or FSL some-times weakly ce-mented	7.9-9.0	lt 2	NA	NA	0.15	NA	NA	NA	NA	
Pena	PC8 418/418	39	Surface	GrL-CL (VGrCL)	10YR 3/3 (7.5YR 3/2)	NA	NA	7.4-8.4	lt 2	(19)	med.	0.28	8	Limestone hills	moderate	high	calcareous
			Sub-surface	Cobbly L (VGrCL-SiCL)	10YR 3/3 (7.5YR 3/2)	none	see subsurface	7.9-8.4	2-4	NA	NA	0.28	NA	NA	NA	NA	

TABLE 2-6. CONTINUED.

Soil Series	Mapping unit and acreage: grazed area/total area	MLRA	Horizon	Texture	Color	Restricting layer: depth (inches)	Characteristics of restricting layer (or substratum)	pH	Salinity (micromhos/ cm)	Slope range percent	Runoff rate	Water erosion suscept ibility	Wind erod- ability index (WEG)	Range site	Permea- bility	AWHC	Comments
Philder	PEC, PFB 50,025/51,850	70	Surface	VFSL-L (FSL- VFSL)	10YR 3/3 (7.5YR 4/4)	NA	NA	7.4-7.8	lt 2	0-15 (2-10)	med.	0.32	3	Shallow and sandy	moderate	low	surface horizon 4" or less: calcareous throughout
			Sub- surface	SCL (SCL-L)	10YR 4/4 (7.5YR 4/4)	18 (10-15)	white indurated caliche, frac- tured in places	7.9-8.4	lt 2	NA	NA	0.2	NA	NA			
Pintura	PI8 10,613/19,374	42	Surface	LFS (FS)	5YR 5/8 (5YR 4/4)	NA	NA	7.9-8.4	lt 2	1-20 (lt 2)	very slow	0.2	2	Deep Sand	rapid	high	noncalcareous
			Sub- surface	FS (FS)	5YR 5/8 (5YR 4/6)	none	light reddish brown LFS to FS	none listed	none listed	NA	NA	none listed	NA	NA	NA	NA	
Reeves	RDA 1,154/1,154	42	Surface	L-SL (L)	10YR 4/3 10YR 4/3	NA	NA	7.4-8.4	2-8	0-9	med. (lt 1)	0.49	4L	Loamy	moderate	low to mod- erately high	moderately deep and calcareous throughout
			Sub- surface	SL-SCL (CL)	7YR 4/4 (7.5YR 5/4)	31 (32)	light gray to white gypsiferous sediments	7.4-8.4	2-8	NA	NA	0.37	NA	NA	NA		
Reyab	RFA 8,193/8,193	70	Surface	L-SCL (L-FSL)	10YR 3/3 (10YR 3/4)	NA	NA	7.9-8.4	lt 2	0-5 (lt 1)	med.	0.49	4L	Draw	moderate slow	moderately high	deep and calcar- eous throughout
			Sub- surface	SiL-L-SCL (CL-SCL)	10YR 4/3 (7.5YR 4/4)	none	like subsurface but lacks structure	7.9-8.4	lt 2	NA	NA	0.55	NA	NA	NA	NA	
Tencee	NTO 7,067/21,036	42,70	Surface	VGrSL (VGrFSL)	7.5YR 4/4 (7.5YR 3/4)	NA	NA	7.9-8.4	lt 2	1-40 (2-5)	rapid	0.15	8	Gravelly	moderate rapid	very low	thin surface horizon; strong- ly calcareous throughout
			Sub- surface	VGrSL (VGrFSL)	7.5YR 4/4 (7.5YR 4/4)	7 (11-14)	indurated caliche, fractured in places	not listed	not listed	NA	NA	none listed	NA	NA	NA	NA	
Tome	MTA, PI8, TD8 20,022/77,687	42,70	Surface	VFSL-SL (FSL-L)	10YR 4/3 (10YR 4/4)	NA	NA	8.5-9.8	4-24	0-5 (lt 1)	slow- medium	none listed	4L	Loamy	moderate	high	deep; weakly developed cal- careous in thin surface horizon
			Sub- surface	L (SCL-L)	10YR 5/4 (7.5 YR 4/4)	none	see subsurface	8.5-9.8	4-24	NA	NA	none listed	NA	NA	NA	NA	

Key for Table Data in parenthesis are those obtained in the field by the EIS team.

Soil series.	Distinct soil types: components of mapping units. Not listed: rock outcrop (25,862 acres/47,256); other soils (37,592/71,788). Other soils are mostly inclusions of listed series.
Mapping unit.	Three-letter codes used in Figure 2-6.
MLRA.	Major Land Resource Areas, defined by SCS.
Horizon.	Surfacetop few inches.
Texture.	Codes are as follows: C = Clay: COB = Cobbly: EX = Extremely: F = Fine; GR = Gravelly; L = Loam(y); S = Sand(y); Si = Silt(y); ST = Stone(y): V = Very.
Color.	Codes defined in Munsell Soil Color Chart.
Restricting layer: depth.	Distance from surface to a subsurface layer, such as strongly cemented or indurated caliche, that would restrict water and/or root movement.
Restricting layer: color, composition.	See Texture for composition codes.
pH.	Degree of soil acidity or alkalinity, from 1 to 14.
Salinity.	Relative salt content of the soil, ranging from 0 to infinity.
Slope Range.	Land slope in percent.
Runoff Rate.	Relative rate at which water runs off of a soil surface.
Water Erosion Susceptibility.	Value given is the soil erodibility factor (K) in the Universal Soil Loss Equation. Relative values are: low = .10-20; moderate = .20-.37: high = .37-.55.
Wind Erodibility Index.	WEG-1 is highest hazard: WEG-8 the lowest. See Appendix C for quantification.
Range Site.	A distinctive kind of rangeland that differs from other kinds of rangeland in its potential to produce native plants.
Permeability.	Surface permeability; rates (inches/hour) are: slow = 0.2-0.6: moderate = 0.6-2.0; rapid = 2.0 - 6.0: very rapid = more than 6.
AWHC.	Available water holding capacity (inches of water in five feet). Very low = less than 3.75; low = 3.75 to 5; moderate = 5 to 7.5; high = more than 7.5.

Source: Data in parentheses are from the field work phase of EIS preparation; other data are from unpublished SCS materials: see Allen and Anderson (1980).

sion: Mountain Foothills, Canyonlands and Rimlands. The Mesa and Alluvial Fans are subject to moderate erosion rates (20 to 23 tons per acre per year gross erosion), while soil movement in the Bolson is very high (140 tons per acre per year gross erosion).

Estimates of water erosion in the Co-use area have been prepared using the methodology of the Pacific Southwest Inter-Agency Committee (PSIAC, 1968). The procedures followed and the results obtained are presented in Allen and Anderson (1980) and summarized in Appendix D (Table D-2). The rate of sediment yield is between 0.3 and 0.5 acre-feet per square mile per year throughout the EIS area. Sediment yields in each natural unit are included in Table 2-1 (see also Table 3-5).

COMPACTION

Qualitative observations during the field season indicate that near water facilities the soil is compacted over areas as large as 10 acres. On clay soils, the compaction could reduce infiltration capacity by as much as 50 percent. On most other soils the reduction could be 15 to 30 percent. There is no effect on sandy or gravelly soils. Because of the reduced infiltration, soil moisture is reduced in the vicinity of water supplies, and the survival potential of seeds may be reduced slightly. In areas away from water the effects of grazing are generally beneficial, and relate to the breaking of soil crusts by trampling.

WATER

SURFACE WATER

Quantity. The Sacramento River is perennial north of the Range, with an annual flow of about 3,000 acre-feet (Titus, 1967). Diversions from the river provide about 67.25 acre-feet per year of potable water to Rim Tank, near Timberon. The tank is also supplied via pipeline with 56 acre-feet per year from Carrizo Springs, located in the southern part of Lincoln National Forest. A pipeline carries water from Rim Tank into the Co-use area with branches reaching all upland pastures except 8. The Orogrande municipal pipeline originates from Sacramento Lake, and carries an undetermined amount of water through Pastures 3 and 2.

During the spring snowmelt season, or in response to summer storms, the Sacramento River usually flows into the Range through Pasture 8. The remaining streams within the area generally originate in higher areas (such as the Mountain Foothills, Canyonlands or Rimlands) and carry flows only in response to storm rainfalls. The runoff rapidly infiltrates the channel beds of these streams, often before reaching lower natural units such as the Alluvial Fans. Earthen dams have been built across many channels and swales, creating small reservoirs or tanks. Some tanks with naturally fine-grained soil in the bottom may hold the infrequent runoff for several months, creating an important source of livestock and wildlife water. Siltation and cattle trampling of tank bot-

toms add to the water-holding capacity of these facilities. However, many are sited on coarser soils and runoff is held for only a few days or weeks before seeping into the subsurface. During the field work phase of the EIS, runoff was observed to by-pass some tanks.

The annual stream flow in the Range is equivalent to 1 to 2 inches of runoff per year in the mountainous areas, and 0.1 inch per year lower down (SCS, 1973). A methodology developed by SCS can be used to estimate the magnitude of the different flood flows which make up most of this runoff. Table 2-7 gives estimated values for flood runoff events of different frequencies, for each of the six natural units. Appendix E presents supporting information related to the runoff estimates.

Quality. Although surface waters on the Range are generally hard and alkaline, quality is adequate for wildlife and livestock use. Table 2-8 summarizes water-quality data for representative water types collected on McGregor, based on samples taken during the EIS field work. A more comprehensive listing of water-quality data is presented in Jenkins and McGough (1980). The tanks often contain some coliform bacteria of natural origin; fecal coliforms are also present. The bacteria levels could cause problems if the supplies were used for human drinking purposes without disinfection.

GROUND WATER

Quantity. Ground water occurs in two distinctive types of aquifers (water-bearing formations) within McGregor. The western part of the area is underlain by basin-fill sediments (the Bolson), which receive considerable recharge from the infiltration of runoff. The water moves westward toward the Tularosa Basin where it evaporates or is consumed by plants. Some water flows southwesterly into Texas (Garza and McLean, 1977; Meyers, 1976). Well yields are variable due to variability in the basin-fill deposits of the Bolson. Yields exceeding 1,000 gallons per minute (gpm) may be obtained in the coarser material high on the alluvial fans, but are less than 100 gpm near the fan toes. Conditions in the Bolson are largely unknown, but the fine-grained nature of the deposits would be a severe limiting factor in terms of well yield and water quality. The water table is at least 250 feet below the surface.

The second aquifer consists of the older sedimentary rocks which underlie the upland portions of McGregor. Few wells have been completed in this area, and little is known about the hydrology of the limestones and sandstones which are potential water sources. Two existing wells are around 1000 feet deep and are poor producers. The limited yield in these deep wells may be caused by small pumps and large lift, since the aquifers being tapped are good producers elsewhere in New Mexico. Three holes were drilled along the Sacramento River in the northeast portion of the range. Although water was found in all of the holes, the first two holes could not be completed successfully due to difficulties experienced during drilling. A yield of about 5 gallons per minute was obtained from the third hole which was drilled to 390 feet. The lack of geologic and geohydrologic data in the upland area makes estimates of ground water availability in this area difficult. Ground water is likely to be available

TABLE 2-7. MAGNITUDE OF FLOOD RUNOFF EVENTS IN CO-USE AREA, UNDER EXISTING CONDITIONS.

Values are peak runoff (in cubic-feet per second per square mile), resulting from 24-hour precipitation on a one sq. mile watershed.

	Frequency of event			
Natural Unit	2-year	10-year	50-year	100-year
Mountain Foothills	737	1515	2376	2703
Canyonlands	384	960	1536	2074
Mesa	217	577	972	1354
Rimland	416	1040	1664	2246
Alluvial Fans	308	822	1301	1815
Bolson	291	743	1196	1583

Source: Appendix E.

TABLE 2-8. WATER QUALITY.

mg/l = milligrams per liter; ml = milliliters.

	Parameters				
Sample Point (Figure 2-5)	Total Dissolved Solids (mg/l)	Total Hardness (mg/l)	Nitrate as N (mg/l)	Turbidity (FTU)	Total Coliform Bacteria (per 100 ml)
Corner Tanks (Mesa)	190	150	0.5	60	31
Sulfur Tank (Alluvial Fan)	133	130	0.6	50	94
Prather Well (sedimentary aquifer)	442	380	2.0	4	0
Cox Well (basin-fill aquifer)	2040	300	0.8	10	0
Rim Tank (pipeline)	269	220	0.8	0	0

Source: representative data taken from more detailed compilation in Jenkins and McGough (1980); that report includes information on sampling and analytical methodology.

from properly designed and constructed wells in most of the area. The depth to water and well yields will be highly variable.

Quality. Quality of water in the western aquifer deteriorates from reasonably good near the recharge area (upper Alluvial Fans) to very poor and saline beneath the Bolson. As indicated in Table 2-8, the upland ground water is hard, but otherwise suitable for most uses. However, it can be expected that any water which has passed through the Yeso Formation underlying the Mesa would be of poor quality.

WATER SUPPLY

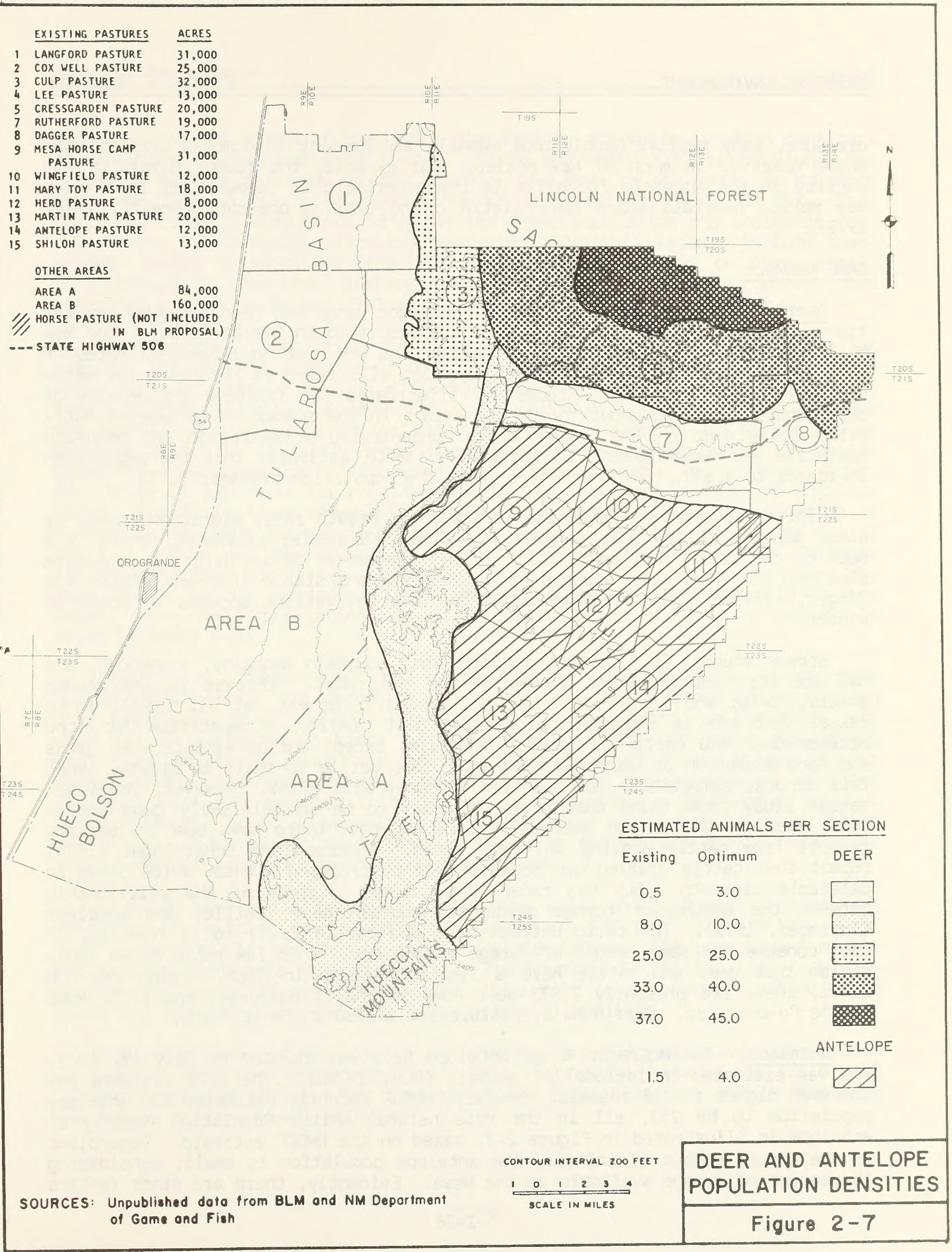
At present, there are 110,000 gallons of water available per day to Rim Tank. This is the bulk of the supply available to stock and wildlife on the Range. Additionally, the Orogrande pipeline provides water for two troughs. The total existing supply from this source is approximately 1,850 gallons per day (gpd). The URA indicates an additional 14,160 gpd is pumped from wells (BLM, 1977). The total supply from the various sources exceeds 125,000 gpd, or 140 acre-feet per year. Data on runoff to surface tanks are not available, but based on the discussions presented above, it is estimated that more than 7,000 acre-feet per year is potentially available.

Most of the runoff evaporates, is transpired by plants or seeps to ground water, representing the largest "loss" of surface water. There are two major uses of the remaining water. Cattle, deer, and antelope consume approximately 50 acre-feet per year. (This assumes 360 gallons per cattle AUM, 408 gallons per deer AUM and 456 gallons per antelope AUM.) Evaporation from open water storage accounts for 36 acre feet of use per year (6 surface acres, 6 feet annual evaporation).

WILDLIFE

Data on the wildlife of McGregor Range were obtained primarily from short-term field studies in the summer of 1979. A report by Smartt (1980) provides information on the study methodology, and contains extensive species and population data for the Range. A list of vertebrate species expected to occur on the Range is taken from that report and provided in Appendix F (Table F-1). Population and biomass data for dominant species obtained during the study period are summarized in Table F-2. (Biomass is the total weight of the entire population of organisms in a given area.) The biomass data are discussed further on p. 2-31. Information on deer and antelope populations is summarized in map form in Figure 2-7.

The results of the field work indicate that the Co-use area provides habitat for a well-balanced assemblage of wildlife communities. This balance has been enhanced by low to moderate grazing pressure and restrictions on human access. Existing grassland communities display conditions which may be reminiscent of conditions before the arrival of domestic livestock in southern New Mexico (York and Dick-Peddie, 1969; Smartt, 1977). At existing large-herbivore



SOURCES: Unpublished data from BLM and NM Department of Game and Fish

DEER AND ANTELOPE POPULATION DENSITIES

Figure 2-7

pressure, many smaller herbivorous mammals are present in numbers greater than those observed in much of New Mexico. For example, the rodent diversity and density in the Mountain Foothills is characteristic of communities in similar New Mexico habitats which have little or no grazing pressure (Smartt, 1978, 1979).

GAME ANIMALS

Deer. The mule deer population of McGregor Range has been surveyed several times. Results of the various studies are described in Smartt (1980). The New Mexico Department of Game and Fish (NMDGF) and BLM have developed estimates of both summer and winter deer populations which will serve as the basis for estimating current deer AUMs. Figure 2-7 illustrates the location and density of deer populations throughout the Co-use area. In the summer, there are an estimated 3,436 deer on the Co-use area, concentrated primarily in the Mountain Foothills and Canyonlands. In the winter, NMDGF estimates that the population increases to 4,627. For the entire year, the population averages 3,730.

Limited information is available about the growth rate, migration, diet, or other aspects of the deer population. From 1978 hunter estimates, there is a buck to doe ratio of 1 to 8 (BLM, 1978b). Based on census data and long-term studies, the deer herd appears to be healthy and stable (Eichert, 1978; Von Finger, 1979). Migration from higher to lower elevations appears to occur in winter.

Browse studies (BLM, 1978b) indicate that mountain mahogany, skunkbush, and oak are the most important shrubs in the deer diet. (Browse is the tender shoots, twigs and leaves of trees and shrubs.) Urness, et al. (1971) found casual forb use is important in raising diet quality. Competition for food between deer and cattle is usually moderate, except during winters when grass and forb depletion or unavailability may cause cattle to shift to browse. When this occurs, competition for mountain mahogany will exist. However, the vegetation study team found that browse appears to be in relatively good condition, even in the canyon bottoms, indicating that there have been no adverse impacts from cattle grazing in these areas. Anderson and Scherzinger (1974) report that cattle grazing can benefit deer by cropping plants, which leads to palatable regrowth. BLM has recently completed a study of the relationship between the amount of forage needed to sustain deer, cattle, and antelope (Springer, 1979). The ratio between deer and cattle is 17 to 1; that is, 17 deer consume the same amount of forage as one cow. This low ratio is an indication that deer and cattle have a limited overlap in diet. Using the AUM ratio, there are presently 2,633 deer AUMs in the 14 pastures, and 3,282 AUMs in the Co-use area. Deer AUMs by pasture are listed in Table 2-10b.

Antelope. The McGregor Range antelope herd was counted on July 19, 1979, and was estimated to include 107 animals (BLM, 1979c). The 1978 estimate was somewhat higher at 146 animals. However, NMDGF recently estimated the antelope population to be 253, all in the Mesa natural unit. Population density of antelope is illustrated in Figure 2-7, based on the NMDGF estimate. Regardless of the actual number of animals, the antelope population is small, considering the amount of forage available on the Mesa. Evidently, there are other factors

which inhibit the growth of the herd. The fawn to doe ratio is often considered an index of antelope herd status. Beale and Smith (1970) considered the potential maximum ratio to be 200 to 100. The fawn to doe ratio on McGregor Range was 93.8 to 100 in 1978 and 82 to 100 in 1979 (BLM, 1978c, 1979c). This declining ratio is consistent with the low total population and indicates that some factor is adversely affecting herd size. Possible factors include topographic limits to migration (the herd is essentially trapped on Otero Mesa), deficiencies in specific dietary needs, especially during pregnancy, and poaching (especially in the 1960's, when buck kills may have been high).

Predation and competition for food could be a source of the population problem, although no evidence of either was noted during the 1979 field season. Forbs and browse make up 80 to 90 percent of the antelope diet (Russell, 1964); grasses comprise the remainder. Einarsen (1947) found that, in northern New Mexico, sagebrush was 25 to 50 percent and grasses 15 to 30 percent of antelope diet. It is likely that in southern New Mexico winterfat is substituted for some sagebrush. This species is eaten by cattle, as are many forbs. Thus there is potential for considerable overlap between livestock and antelope diets. The field teams observed that existing grazing pressure from cattle is not likely to limit the amount of forbs available to antelope during the spring fawning season, nor the amount of forage available at other times. Springer (1979) found that one cattle AUM equals 19 antelope AUMS; one cow consumes the same forage as 19 antelope. There are 160 antelope AUMs currently on the Range, using NMDGF population data. The distribution of AUMs by pasture is given in Table 2-10b.

Small game. Scaled quail and Gambel's quail are both common on McGregor Range. These birds are characterized by extreme fluctuations in population size (Campbell, et al., 1973). In the Canyonlands, scaled quail numbers were high, at an estimated 93 birds per square mile. Gambel's quail populations were large on the Alluvial Fans (75 per square mile) and in the Bolson (32 per square mile). The observed high densities of quail may be related to light grazing, which has resulted in good range condition and a good amount of protective cover. Quail seasonally concentrate around water sources even though their water requirements are minimal. They also concentrate around protective cover which is essential for continued existence.

Mourning dove and a few white-winged dove occur on the Range. The highest densities of mourning dove occurred in the Bolson (49 per square mile), Mountain Foothills (36 per square mile), and Canyonlands (38 per square mile). White-winged dove were rare; however, in the Mountain Foothills, there are populations of about 10 per square mile. Dove tend to concentrate around water holes and seed-bearing vegetation in a variety of habitats.

The study team did not observe any changes in small game populations caused by heavy grazing near water supplies. This is probably because the field work was performed two months after the end of the grazing season, and at that time the forage was relatively abundant.

Other game animals. BLM (1977) indicates that there are wild turkey, black bear, and cougars on the Range. During the 1979 study deer kills were noted which provided evidence of cougars in the higher areas; cougars have also been observed by BLM personnel.

SMALL MAMMALS

Lists of small mammal species in the study area are detailed in Appendix F, and in DOA (1977) and BLM (1977). Composition and species diversity of small mammal communities vary considerably among the six natural units on McGregor Range. There is a large rodent population, which includes many species of rats, mice, and squirrels. Species diversity of rodents is generally large; for example, 11 rodent species occur in the Alluvial Fans and 8 are found in the Canyonlands. Animal densities are also high, reaching 862 animals per square mile in the Alluvial Fans, and 945 per square mile in the Mountain Foothills. Although species diversity in the Bolson area is less than in most other areas, density and biomass are relatively large (see Table 2-9, discussed on page 2-31). Based on the species present, about half of the rodent population is dependent on grasses, forbs, and shrubs as a food supply. However, many of the rodents are seed or insect eaters, and in the Bolson essentially none of the population is directly dependent on forage plants.

Rabbit densities also vary among units. The highest density of cottontails occurs in the Mountain Foothills, while black-tailed jackrabbits are most abundant in the Bolson, and are common elsewhere. Rabbits are least significant in the Mesa and Canyonlands units. As grazing animals, rabbits represent one of the main types of wildlife which compete with cattle for food supplies.

OTHER ANIMALS

Bats. Two maternity colonies (mothers and their young) of fringed myotis were found in the Mountain Foothills, each consisting of several hundred individuals. Such colonies are rare where human traffic and disturbance occur. Their presence on McGregor most likely results from the restrictions on access.

Non-game birds. Lists of birds appear in Appendix F; see also BLM (1977) and DOA (1977). Diversities and densities vary among natural units. The greatest diversity of bird species was found in the Mountain Foothills (26 species). Densities and biomass were also highest in this unit (Smartt, 1980). Generally, the Bolson has the lowest numbers of non-game bird species. Aquatic birds and shorebirds occur on the Mesa near earthen ponds and stock tanks.

Raptors. Many raptors are common on the Range. The study team spotted one golden eagle in the Canyonlands. Red-tailed hawks were common in most habitats. Two Swainson's hawks and two Harris' hawks were seen in grassland areas. Potential nesting sites for peregrine falcons occur in the Rimlands (BLM, 1977). BLM personnel report that prairie falcons have been observed on the Range.

Reptiles. Reptile diversity and population conditions vary among the natural units (see Smartt, 1980). Observations of reptiles of particular interest include the Mohave rattlesnake and two species for which range extensions were recorded, the Mexican kingsnake and the short-horned lizard. The short-horned lizard was found in the Rimlands and Mesa areas and the side-blotched lizard in the Alluvial Fans. Both the side-blotched lizard and the western whiptail were common in the Bolson area. Only the Western fence lizard was observed in the Mountain Foothills, but its density was too low to be counted. The Chihuahua whiptail was the only numerically important lizard in the Canyonlands (Table F-2). The greatest lizard diversity occurred on Otero Mesa. On McGregor Range overall, the Chihuahua whiptail occurred in the greatest diversity of habitats and was responsible for the 31 percent of the lizard census.

THREATENED OR ENDANGERED SPECIES

On December 20, 1979, BLM consulted with the U.S. Fish and Wildlife Service (FWS) regarding species which are listed or proposed to be listed as threatened or endangered. FWS replied on January 11, 1980, as follows. "Peregrine falcon (*Falco peregrinus*) - This species may exist in the project area as a nesting resident and or migrant." The peregrine falcon was not observed during the study.

The Tularosa black-tailed prairie dog, which is considered threatened in New Mexico (Hubbard, 1979), was identified by the study team on Otero Mesa. It is possible there are other regionally threatened species on the Range. Records of occurrence for the rock rattlesnake, Texas lyre snake and the Trans-Pecos rat snake exist from areas just south of McGregor Range. The snakes are also likely to be found on the Range. A list of potential habitats for threatened or endangered species which could occur on McGregor Range is contained in the URA (BLM, 1977). These species include the peregrine falcon, aplomado falcon, Baird's sparrow, McCown's longspur, and Nelson's pocket mouse.

BIOMASS AND FOOD SUPPLY

The previous discussions have touched on the relationship between wildlife and food supplies, with particular reference to possible competition between wildlife and cattle. The 1979 field studies obtained considerable data, summarized below, which help define the food needs of wildlife in the Co-use area. In Chapter 3 the data are used to provide a first approximation of the forage requirements of future wildlife populations.

The biomass (weight) data presented in Smartt (1980) are summarized in Table 2-9 by natural unit, and in Table 2-10 by pasture. The data are further organized according to the feeding habits characteristic of different animal groups. The three major categories of feeding habit are seed-eating, browsing, and forage grazing. Insect-eaters are not included, as these animals constitute a minor portion of the wildlife on McGregor. Assumptions required for use of the data are discussed in Chapter 3 (p. 3-31). For purposes of environmental evaluation, the principal assumption is that equal weights of

TABLE 2-9. RELATIONSHIP BETWEEN VERTEBRATE BIOMASS AND FOOD HABITS, BY NATURAL UNIT.

GA = sq. miles in grazed area (fourteen pastures). AB = sq. miles in areas A and B.

		BIOMASS (POUNDS PER SQ. MILE)			
NATURAL UNIT	ANIMAL GROUP	SEED EATERS	BROWSERS	GRAZERS	TOTAL
MOUNTAIN FOOTHILLS (GA = 23.44 AB = 0)	MULE DEER	-	3,700	3,700	7,400
	SMALL MAMMALS	168	53	53	274
	RABBITS	-	472	472	944
	BIRDS	54	-	-	54
	TOTAL	222	4,225	4,225	8,672
CANYONLANDS (GA = 59.38 AB = 0)	MULE DEER	-	3,325	3,325	6,650
	SMALL MAMMALS	151	27	68	246
	RABBITS	-	160	160	320
	GAME BIRDS	46	-	-	46
	OTHER BIRDS	26	-	-	26
	TOTALS	223	3,512	3,553	7,288
MESA (GA = 171.88 AB = 0)	MULE DEER	-	50	50	100
	PRONGHORN ANTELOPE	-	-	165	165
	SMALL MAMMALS	85	39	39	163
	RABBITS	-	92	92	184
	BIRDS	31	-	-	31
	TOTALS	116	181	346	643
RIMLANDS (GA = 3.13 AB = 221.88)	MULE DEER	-	800	800	1,600
	SMALL MAMMALS	188	130	130	448
	BIRDS	8	-	-	8
	TOTALS	196	930	930	2,056
ALLUVIAL FANS (GA = 95.31 AB = 184.38)	MULE DEER	-	295	295	590
	SMALL MAMMALS	355	161	174	690
	RABBITS	-	249	249	498
	GAME BIRDS	36	-	-	36
	OTHER BIRDS	21	-	-	21
	TOTALS	412	705	718	1,835
BOLSON (GA = 70.31 AB = 100.0)	MULE DEER	-	50	50	100
	SMALL MAMMALS	494	-	-	494
	RABBITS	-	365	365	730
	GAME BIRDS	28	-	-	28
	OTHER BIRDS	1	-	-	1
	TOTALS	523	415	415	1,353

Source: Smartt (1980); and NMDGF unpublished data.

TABLE 2-10. TOTAL WILDLIFE BIOMASS, BY PASTURE.

PART A. Seed-eating, browsing and grazing animals, total pounds.

Pasture	Mule deer	Antelope	Small mammals	Rabbits	Birds	Game birds	TOTAL BIOMASS	Cattle biomass
1	13,266	-	27,297	31,372	392	1,494	73,821	258,000
2	3,906	-	19,297	28,516	39	1,094	52,852	175,000
3	150,110	-	25,103	20,506	1,132	1,947	198,798	306,000
4	150,313	-	5,556	19,175	1,097	-	176,141	200,000
5	210,156	-	7,775	11,950	900	1,294	232,075	236,000
7	26,219	-	18,967	14,016	647	1,028	60,877	287,000
8	71,719	224	13,342	11,069	620	994	97,968	262,000
9	4,844	8,064	7,895	8,913	1,502	-	31,218	832,000
10	4,172	2,464	5,526	4,922	534	169	17,787	420,000
11	4,344	4,032	6,231	6,156	841	113	21,717	469,000
12	1,250	2,128	3,075	4,000	325	575	11,353	233,000
13	5,469	4,928	5,539	5,463	933	-	22,332	454,000
14	1,875	3,136	3,056	3,450	581	-	12,098	285,000
15	2,031	3,360	3,311	3,738	630	-	13,070	256,000
TOTALS	649,674	28,336	151,970	173,246	10,173	8,708	1,022,107	4,673,000
AREA A	162,667		70,149	23,346	1,659	1,688	259,509	0
AREA B	311,133		205,875	141,475	6,150	7,750	672,383	0
TOTALS	1,123,474	28,336	427,994	338,067	17,982	18,146	1,953,999	4,673,000

PART B. Grazing animals, total pounds.

Pasture	Mule deer	Antelope	Small mammals	Rabbits	TOTAL BIOMASS	Cattle biomass	Deer AUMS	Antelope AUMS
1	6,633	-	2,991	15,686	25,310	258,000	18	0
2	1,953	-	-	14,258	16,211	175,000	14	0
3	75,055	-	6,478	10,253	91,786	306,000	982	0
4	75,157	-	1,077	9,588	85,822	200,000	530	0
5	105,078	-	2,079	5,975	113,132	236,000	742	0
7	13,110	-	4,622	7,008	24,740	287,000	47	0
8	35,860	224	3,418	5,535	45,037	262,000	226	1
9	2,422	8,064	1,889	4,457	16,832	832,000	18	45
10	2,086	2,464	684	2,461	7,695	420,000	7	14
11	2,172	4,032	544	3,078	9,826	469,000	10	23
12	625	2,128	488	2,000	5,241	233,000	5	12
13	2,735	4,928	1,361	2,732	11,756	454,000	20	28
14	938	3,136	731	1,725	6,530	285,000	7	18
15	1,016	3,360	792	1,869	7,037	256,000	7	19
TOTALS	324,840	28,336	27,154	86,625	466,955	4,673,000	2,633	160
AREA A	81,334	-	19,125	11,673	112,132	-	493	0
AREA B	155,567	-	25,550	70,738	251,855	-	156	0
TOTALS	561,741	28,336	71,829	169,036	830,942	4,673,000	3,282	160

Source: Smartt (1980); Deer and antelope biomass and AUM estimates based on New Mexico Department of Game and Fish population data.

different species generally require the same amount of food (for example, one 1000 pound cow eats the same amount of forage as 100 10-pound rabbits). Based on this assumption, a number of provisional conclusions can be reached by comparing the biomass of different types of animals.

1. Under existing conditions, the total biomass of cattle far exceeds the total biomass of wildlife. Cattle make up 71 percent of the vertebrate biomass, deer 17 percent, small mammals 6 percent, rabbits 5 percent, and other animals (birds, antelope) 1 percent.

2. Not quite half of the wildlife biomass (43 percent) is dependent on grazing for food supply. This portion of the wildlife directly competes with cattle for the available forage. Some additional competition occurs to the extent that cattle utilize browse as a food source.

3. Mule deer make up the bulk of the wildlife biomass (58 percent), and also are the most important wildlife species in terms of forage use, comprising 68 percent of the biomass of wildlife grazers. Antelope constitute 1.4 percent of the total wildlife biomass and 4 percent of the wildlife biomass involved in grazing. At present this animal plays a relatively minor role in the wildlife community. Rabbits are of considerable importance, making up 17 percent of the wildlife biomass and 20 percent of the grazing biomass. Small mammals, especially rodents, constitute 22 percent of the wildlife biomass and 9 percent of the grazing biomass. Birds are a minor consumer of forage.

4. In a typical portion of the Co-use area, the biomass of rabbits and small mammals involved in grazing is 770 pounds per square mile. Assuming that these animals have the same diet requirements as an adult cow (see p. 3-31), the forage use by the small mammals and rabbits amounts to 9.2 AUMs per year per square mile, or approximately 3,900 AUMS for the entire 14 pastures.

5. In Southwestern grasslands, small mammal biomass appears to be lower where there is a relatively homogenous forage supply (Snyder, 1976). This is illustrated on the Mesa where existing forage (predominantly grass) is divided among antelope, rabbits, herbivorous rodents, and cattle. In areas such as the Bolson, where there are fewer large herbivores and grasses, the rabbit populations are much higher.

CULTURAL RESOURCES

As part of the field study phase of this EIS, an archaeological survey was performed in 1979. The survey was a random sample of over 2,170 acres in the 14 existing pastures; it included transects as well as field checks of a previous study performed in 1976. The methodology and principal results of the EIS survey are described in Lord (1980). Site locations, transect locations, and field notes are on file at the BLM District Office in Las Cruces. Addi-

tional information on the area is available from the archaeological literature which is summarized in Lord (1980) and Le Blanc and Whalen (in press).

The area of McGregor Range contains cultural remains which span a time period of at least 12,000 years, and which include structures or artifacts from the Paleo-Indian, Archaic, Jornada Mogollon, Apache, and Anglo-American periods. Archaeological sites include camps, permanent habitations, procurement and processing areas, prehistoric quarries, rock art, and ranches. Areas of high site density include Sacramento Canyon (32 recorded sites), McAfee and El Paso Canyons (21 recorded sites), Culp Canyon (14 recorded sites), and the Tularosa Basin (high site density). Over 50 percent of the sites have ceramic remains.

Each site recorded in the EIS area has been classified by type, using definitions which are presented in Lord (1980). Tables 2-11 and 2-12 indicate the distribution of the different site types by natural unit and by grazing unit. Figure 2-8 shows areas of high site density. The majority of sites (46 percent) are located in the Canyonlands. The Alluvial Fans are second in importance (27 percent of all sites). The sites are typically found on higher ground near drainages. The site distribution is partly the result of the nonrandom nature of the 1976 survey which was concentrated in the Canyonlands, Alluvial Fans, and Mountain Foothills units. However, a comparison of site densities between the Canyonlands and Rimlands indicates that the Canyonlands is in fact an area of relatively high density.

Sites in the EIS area can be broken down into four major types.

1. All residential sites are ceramic villages which are concentrated in the Bolson and Alluvial Fan natural units, with one site in the Rimlands. Considered to be part of the Jornada Branch of the Mogollon (see Lehmer, 1948), these sites were occupied by people who relied on agriculture for the majority of their food requirements, supplemented by wild plants and animals.

2. Ceramic camp sites included complex ceramic camps, burned rock loci, the isolated hearths, and rockshelters. While located primarily in the Alluvial Fans and Canyonlands, the sites are scattered in all areas. The sites usually occur near intermittent streams and were probably used as hunting and gathering stations and in-transit camps. Burned rock loci in the Canyonlands were probably used for procurement and preparation of agave and sotol.

3. Non-ceramic camp sites included non-ceramic complex camps, burned rock loci containing no ceramics, lithic scatters, and some rockshelters. They are located in the Canyonlands and Mountain Foothills region, with several in the Alluvial Fan natural unit. These sites were hunting and gathering camps which may be attributed to Archaic peoples or to ceramic peoples who where supplementing their agricultural diet.

TABLE 2-11

DISTRIBUTION OF CULTURAL RESOURCE SITES BY NATURAL UNIT.

Entries: A = number of sites: B = percent of all sites in the natural unit; C = percent of all sites in Co-use area.

	NATURAL UNITS						
Site Types	Bolson	Alluvial Fans	Rimlands	Mesa	Canyon-lands	Mountain Foothills	TOTALS
Village	A. 4 B. 2.4% C. 57.1%	A. 7 B. 4.1% C. 14.6%	A. 1 B. 0.6% C. 7.1%				A. 12 C. 7.1%
Ceramic Camp	A. 1 B. 0.6% C. 14.3%	A. 21 B. 12.4% C. 43.7%	A. 1 B. 0.6% C. 7.1%	A. 3 B. 1.8% C. 42.9%	A. 19 B. 11.2% C. 24.7%	A. 1 B. 0.6% C. 6.2%	A. 46 C. 27.2%
Burned Rock Loci, Ceramic	A. 1 B. 0.6% C 14.3%	A. 7 B. 4.1% C. 14.6%	A. 3 B. 1.8% C. 21.4%	A. 1 B. 0.6% C. 14.3%	A. 14 B. 8.3% C. 18.2%	A. 3 B. 1.8% C. 18.7%	A. 29 0. 17.2%
Isolated Hearth		A. 7 B. 4.1% C. 14.6%	A. 1 B. 0.6% C. 7.1%	A. 1 B. 0.6% C. 14.3%	A. 6 B. 3.5% C. 7.8%		A. 15 C. 8.8%
Aceramic Camp		A. 3 B. 1.8% C. 6.2%			A. 8 B. 4.7% C. 10.4%		A. 11 C. 6.5%
Burned Rock Loci, Aceramic		A. 1 B. 0.6% C. 2.1%			A. 15 B. 8.8% C. 19.5%	A. 7 B. 4.1% C. 43.7%	A. 23 C. 13.6%
Rockshelter			A. 6 B. 3.5% C. 42.9%				A. 6 C. 3.5%
Isolated Bedrock Mortar		A. 1 B. 0.6% C. 2.1%			A. 1 B. 0.6% C. 1.3%		A. 2 C. 1.2%
Ceramic Scatter							
Lithic Scatter					A. 8 B. 4.7% C. 10.4%	A. 4 B. 2.4% C. 25.0%	A 12 C. 7.1%
Rock Circle					A. 3 B. 1.8% C. 3.9%		A. 3 C. 1.8%
Quarry							
Historic	A. 1 B. 0.6% C. 14.3%	A. 1 B. 0.6% C. 2.1%	A. 2 B. 1.2% C. 14.3%	A. 2 B. 1.2% C. 28.6%	A. 3 B. 1.8% C. 3.9%	A. 1 B. 0.6% C. 6.2%	A. 10 C. 5.9%
TOTALS	A. 7 B. 4.1%	A. 48 B. 28.4%	A. 14 B. 8.3%	A. 7 B. 4.1%	A. 77 B. 45.5%	A. 16 B. 9.5%	A. 169 B. 100%

Source: Lord (1980).

TABLE 2-12. DISTRIBUTION OF CULTURAL RESOURCE SITES BY GRAZING UNITS.

Indicates numbers of sites of each type: and percent of total sites in area.

	1	2	3	4	5	7	8	9	10	11	12	13	14	15	AREA A	TOTALS
Village Complex 7.1%	8 4.7%	2 1.2%	1 0.6%												1 0.6%	12
Ceramic Camp	8 4.7%	1 0.6%	7 4.1%	1 0.6%	8 4.7%	2 1.2%	16 9.5%	2 1.2%							1 0.6%	46 27.2%
Burned Rock Loci, Ceramic	1 0.6%	1 0.6%	4 2.4%	3 1.8%	8 4.7%	2 1.2%	6 3.6%	1 0.6%							3 1.8%	29 17.2%
Isolated Hearths		1 0.6%	3 1.8%		3 1.8%	2 1.2%	4 2.4%					1 0.6%			1 0.6%	15 8.9%
Aceramic Camp			2 1.2%		5 3.0%		4 2.4%									11 6.5%
Burned Rock Loci, Aceramic			6 3.6%	7 4.1%	6 3.6%	2 1.2%	2 1.2%									23 13.6%
Rockshelter															6 3.6%	6 3.6%
Lithic Scatter			5 3.0%	4 2.4%	2 1.2%		1 0.6%									12 7.1%
Isolated Motars		1 0.6%			1 0.6%											2 1.2%
Rock Circles					2 1.2%		1 0.6%									3 1.8%
Historic				1 0.6%	1 0.6%		4 2.4%		1 0.6%	1 0.6%					2 1.2%	10 5.9%
TOTALS	17 10.1%	6 3.6%	28 16.6%	16 9.5%	36 21.3%	8 4.7%	38 22.5%	3 1.8%	1 0.6%	1 0.6%		1 0.6%			14 8.3%	169 100%

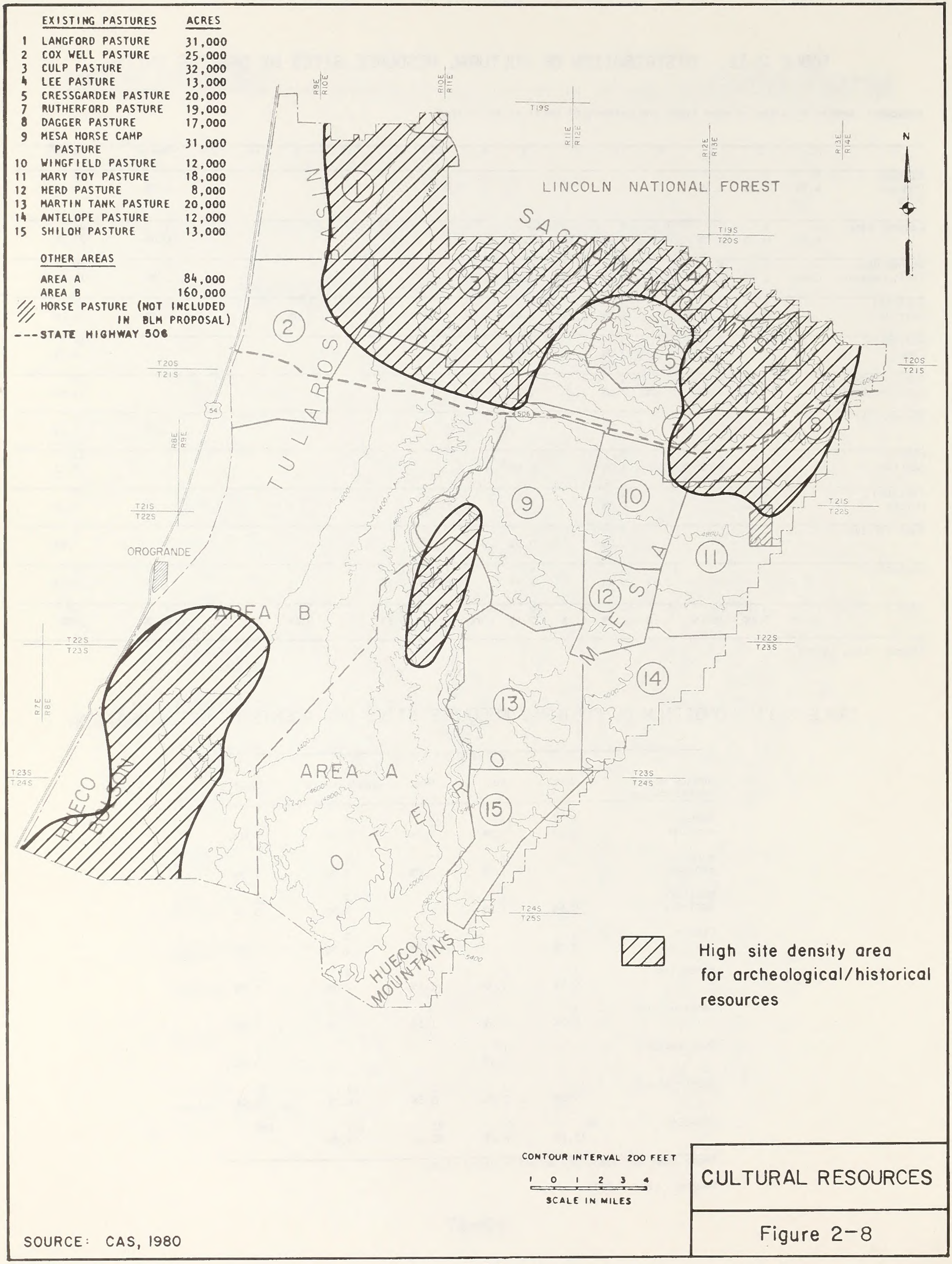
Source: Lord (1980).

TABLE 2-13 CONDITION OF CULTURAL RESOURCE SITES AND AGENTS OF DETERIORATION.

	CONDITION				
Agents of Deterioration	Good	Fair	Poor	Undetermined	TOTALS*
Water erosion	8 4.0%	15 7.5%	15 7.5%	75 37.7%	113 56.8%
Wind erosion		2 1.0%	2 1.0%	11 5.5%	15 7.5%
Military activity	1 0.5%	3 1.5%		7 3.5%	11 5.5%
Cattle	1 0.5%		1 0.5%	3 1.5%	5 2.5%
Vandalism	1 0.5%	2 1.0%	3 1.5%	4 2.0%	10 5.0%
Construction	1 0.5%	1 0.5%	3 1.5%	2 1.0%	7 3.5%
Cultivation		1 0.5%			1 0.5%
Undetermined	18 9.0%	5 2.5%	1 0.5%	13 6.5%	37 18.6%
TOTALS*	30 15.1%	29 14.6%	25 12.6%	115 57.8%	199

*More than one agent may affect a given site.

Source: Lord (1980).



CULTURAL RESOURCES

Figure 2-8

SOURCE: CAS, 1980

4. Historic sites are ranching-related and are scattered throughout the EIS area, with the highest number occurring in the Canyonlands.

The recorded sites are in various stages of deterioration. The available information indicates 29 sites in good condition, 19 in fair, 21 in poor, and 100 in undetermined condition (see Lord, 1980). Table 2-13 (p. 2-37) provides data on the factors responsible for site deterioration. Wind and water erosion are the most significant factors responsible for displacement or even destruction of artifacts. Impacts are greatest near major arroyos where some of the higher site densities are observed. Military activity, cattle trampling, and vandalism are other causes of significant deterioration of site condition. Currently, the impact of cattle trampling in areas of heavy use (near waterholes) is minimized because most grazing occurs in areas of low site density.

During preparation of the EIS, the New Mexico State Historic Preservation Officer was consulted regarding sites which are eligible or potentially eligible for inclusion in the National Register of Historic Places. His response is printed in Appendix H, and identifies 232 sites with such potential. These include sites outside the 14 pastures. Studies by Beckes and Dibble (1976) and Beckes (1977) identified 25 sites within the grazed area which are eligible or potentially eligible for inclusion in the National Register. These sites are listed in Lord (1980), and include 6 habitation camps or sites, 11 ceramic camps, 1 lithic camp, 3 in rock shelters (1 with rock art), 3 historic buildings, and portions of the Oliver Lee Pipeline. Most of the sites are located in the Canyonlands, Alluvial Fans and Rimlands natural units.

VISUAL RESOURCES

Description of the visual elements of the landscape involves an analysis of color, form, line, and texture. At McGregor Range, the dominant colors are the very light pastels of limestones, sand, and desert vegetation. Line elements are strongly horizontal due both to the existence of the mesa and to the exposure of horizontal rock beds in the uplands. The foothills appear small compared to the massive, blocky form of Otero Mesa, but the foothills do provide some contrast in texture due to their pinyon-juniper cover. Of existing man-made features in the 14 pastures, only corrals and roads are discernable, and these only from the air. On ground level, all of the man-made features are very subordinant in the landscape, except to viewers located next to a facility.

Visual resources have been analyzed systematically by BLM (1977). The process resulted in classification of the Mesa, Rimlands, Mountain Foothills, and Canyonland areas as moderately scenic, and the Alluvial Fans and Bolson areas as low in scenic value. No part of the Co-use area was rated as outstanding, but the Mesa was ranked highest. BLM also determined Visual Resource Management (VRM) classes. These classes are used to determine the degree of change allowed where construction of facilities is proposed. Because the Alluvial Fans and the Bolson are in the visual foreground in terms of major accessways, they received a higher VRM class (Class III; 450 square miles) than did other parts of the Range (Class IV; 354.7 square miles).

Class III VRMs allow management activities to be evident but subordinate to the characteristic landscape. Management of Class IV areas allow changes which are a dominant feature of the landscape; however, the change must repeat the basic elements in the characteristic landscape.

WILDERNESS

BLM is in the process of identifying public lands which are potentially suitable for designation as wilderness pursuant to the Wilderness Act of 1964 (P.L. 88-577). The lands in McGregor Range are being inventoried by the District Office in Las Cruces. An initial inventory has identified areas with the following characteristics.

1. Area contains at least 5,000 acres of land or is of a size sufficient to make preservation and use of the land in an unimpaired condition practicable.

2. Area appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.

3. Area provides outstanding opportunities for solitude or for a primitive and unconfined type of recreation.

Three parcels which fall within the Range may meet these minimum wilderness characteristics, and have been identified for a more intensive inventory (see Figure 2-9, p. 2-42). They are:

NM-030-152 Culp Canyon - 11,080 acres;
NM-030-155 Cress Garden - 11,760 acres;
NM-030-165 Bug Scuffle Canyon - 5,720 acres.

These areas are contiguous with two roadless areas in the Lincoln National Forest (RARE II areas 3-078 and 3-974, recommended by U.S. Forest Service for non-wilderness). Intensive inventory of the three areas within the Range was completed in early 1980. Culp Canyon received a staff recommendation for further study, while Cress Garden did not. The staff recommended that a decision with respect to Bug Scuffle Canyon be deferred until a joint BLM-Forest Service study is completed. On February 29, 1980, the BLM State Director will make his recommendation on whether these areas merit further study as Wilderness Study Areas (WSAs). After a 90-day public comment period, those areas not recommended as WSAs will be dropped from further consideration. Areas designated as WSAs by September 30, 1980, will be studied within eleven years, and recommendations will be made to the President and Congress as to which areas are suitable for Congressional designation as wilderness areas.

Until these areas are eliminated from the WSA designation process, Section 603(c) of FLPMA allows activities which existed prior to October 21, 1976, to continue. However, BLM must manage activities within these areas in a manner

which will prevent any impairment for potential wilderness designation. If the areas are identified as WSAs, the BLM will use its interim management policy and surface protection regulations to guide management activities so as to prevent impairment for potential wilderness designation.

RECREATION

With the exception of hunting, the Range is closed for recreational use. In most years NMDGF has issued 800 deer licenses for the Range. Hunters are allowed on the Range for up to three specific, consecutive weekends. Generally, 25 antelope permits are issued each year. Additionally, during off-duty hours, military personnel and civilians are allowed to hunt dove and quail in designated areas. In 1976 there were 1,425 visitor days for big-game hunting and 475 visitor days for upland game hunting (BLM, 1977).

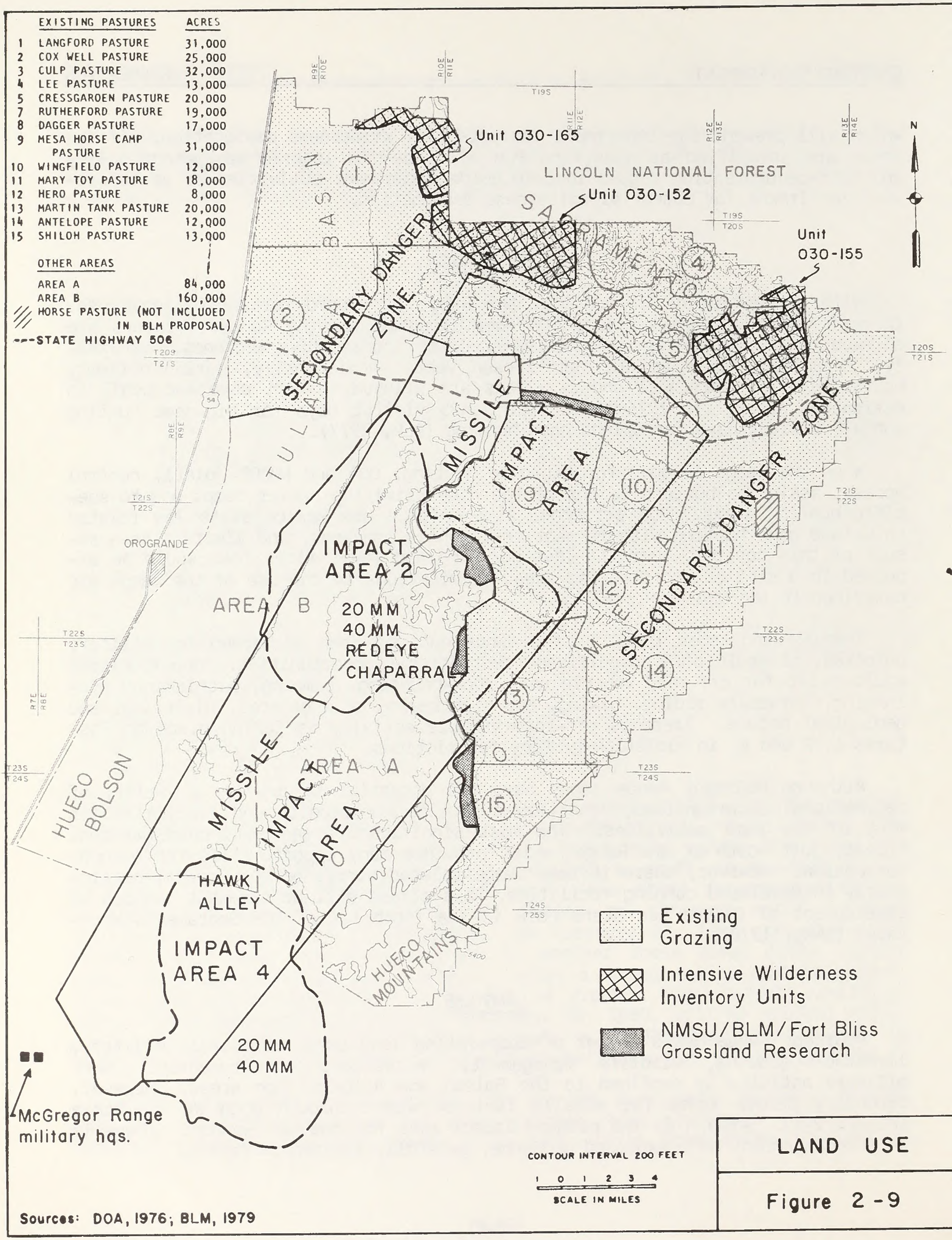
When the Range is open for big-game hunting, DOA and NMDGF jointly control access, assigning hunters to one of the nine primitive hunter camps and to specific hunting areas. DOA personnel also enforce New Mexico state law related to upland game hunting with respect to licenses, seasons, and limits. As a result of this control, there is less poaching and fewer fires than would be expected in a similar uncontrolled area. Limitations to the use of the camps are described in the URA (BLM, 1977).

The URA indicates that, if the Range had not been withdrawn for military purposes, it would offer significant recreational opportunities. Opportunities would exist for off-road vehicle use, rock-hounding, camping, picnicking, spelunking, horseback riding, hiking, and sightseeing of a general, historical and geological nature. Trespass off-road vehicle activity is taking place on Pastures 1, 2 and 4, in violation of Army restrictions.

Although McGregor Range lands have the potential to provide a variety of recreational opportunities, other areas provide opportunity and facilities for many of the same activities. The most significant area is Lincoln National Forest, just north of the Range, which provides many opportunities for outdoor recreation. However, there is some usage-related stress on the Forest, particularly in developed camping facilities. This stress will be somewhat reduced by development of Oliver Lee State Park in the foothills of the Sacramento Mountains (SPRC, 1978).

LAND USE

McGregor Range has a number of cooperating land uses, especially military, livestock grazing, wildlife management, recreation, and research. Most military activity is confined to the Bolson and Alluvial Fan areas. However, secondary danger zones for missile firings extend through much of the Range (Figure 2-9). Area A is the primary impact zone for one new weapon. There is an unknown amount of unexploded ordnance, generally located in Area A.



LAND USE

Figure 2-9

LIVESTOCK GRAZING

Existing program. Prior to 1957, the Range had a grazing history similar to that of much of the southwestern U.S. A small number of large ranches used intermixed private and public lands to support cattle and sheep. When the Range was withdrawn in 1957, the Commanding Officer at Ft. Bliss did not allow grazing. However, the external boundaries were not fenced and livestock from surrounding areas continued to graze with no apparent harm. This trespass grazing was one reason for the Commanding Officer's decision to officially sanction grazing in a portion of the Range. The Co-use agreement allowing such grazing was signed in 1966 (see Appendix B).

Grazing was initiated in 1967. Pastures were defined by historical utilization. By 1970, BLM had developed the present management program, which allows approximately 9 months of grazing each year, usually from October 1st to June 30th. In the event one pasture is damaged by fire, a rested pasture may be put into service. In a typical year 4,500 cattle have utilized the Range and there have been about 40,000 AUMs of livestock grazing. When Pasture 2 is developed, these numbers should increase by about five percent. With Pasture 2, the number of cattle will average 4,627 per year. Total AUMs will average 42,060 per year. In addition about 4,765 deer (2,633 AUMS) and 253 antelope (160 AUMs) use the grazed area during at least part of the year. Decisions regarding pasture resting and allowable AUMs are made each summer by BLM's professional range management personnel. In general a conservative approach has been followed; for the Range as a whole, overstocking has been avoided. The result is a grassland and shrubland environment with a grazing capacity equal to or greater than most comparable land elsewhere in New Mexico.

The right to use the forage within the existing pastures is determined each year by competitive bidding at a public auction, under the provisions of the Federal Material Disposal Act of 1947, as amended. Income from the bidding is retained by BLM for maintenance of, and improvements to, the grazing lands of McGregor. In recent years bids have been around $5 per AUM and total income has ranged between $119,000 and $238,000 per year. Appendix G provides information on the individual pastures, including the size, recent grazing use, and amount of money which the public has bid and paid to use the units. The Appendix also summarizes the amount and value of grazing which has occurred each year since 1967.

Because grazing leases are awarded to high bidders, and because the parcels are relatively large, lessees are generally large operators who purchase cattle prior to the grazing season and send or sell them to feedlots when the season is over. A few lessees are operators who have ranches in the vicinity of McGregor; these ranchers usually move their cattle to private land during the off-season. Most pastures are used for cow-calf operations; those with rough terrain are usually designated for yearling use by the BLM Area Manager. Since 1975, about 20 percent of the lessees have been from Otero County. Another 25 percent are from elsewhere in the state (usually Roswell and Carlsbad) and 44 percent from Texas. The remaining 11 percent are from other states, generally

Oklahoma, Arizona and Kansas. In the 1979-80 season, seven successful bidders will graze the 14 existing pastures. One bidder from Texas will graze four units, and two bidders will graze two pastures each. Three lessees are from Texas or Oklahoma, three are from New Mexico but outside Otero County, and one operator is from Orogrande.

One local operator and one out-of-state operator were interviewed during preparation of the EIS. They observed no major problems with existing grazing use, but noted that a more uniform distribution of cattle on individual pastures would increase efficiency. Another problem is that there are many fires resulting from missile crashes and other defense ordnance. From July 1973 to June 1976, an average of 5,000 acres of the Co-use area were damaged each year by such range fires (RCD, 1976).

Suitability. Rangeland is classified as suitable, potentially suitable or unsuitable for livestock grazing based on criteria which relate to: distance from reliable water; slope; erosion condition; and forage production (BLM Instruction Memorandum NMSO 79-76). Criteria used by the BLM District Office in Las Cruces resulted in the following suitability classification for lands in the Co-use area.

1. Existing grazed areas.

   a. Virtually all areas within the Mesa, Alluvial Fans, and Bolson natural units are considered suitable for grazing (218,000 acres). The rating is assigned because the areas are within four miles of reliable water, slopes are not excessive, and problems related to erosion and productivity are not severe. An exception is the gyp range site in the northwest corner of Pasture 1 (1,600 acres), which is unsuitable due to low forage production. This leaves 216,400 acres rated suitable.

   b. In the Mountain Foothills and Canyonlands natural units, about 25 percent of the land (13,250 acres) is presently suitable for grazing. The remainder (39,750 acres) is considered potentially suitable, limited at present because of a combination of steep slope and distance to water.

2. Areas A and B.

   All areas (244,000 acres) are potentially suitable with the addition of reliable water supplies. In the Alluvial Fans and Bolson units, the water would need to be spaced at 4-mile intervals. In the Rimlands, water would be needed at distances from 0.3 to 0.6 miles apart.

OTHER USES

Active management of wildlife resources on the Range includes the provision of water within each pasture, the hunting-related programs of NMDGF (see Appendix B), and BLM's annual browse transect. Although predator control is a potential part of land-use management within McGregor, BLM personnel indicate

that there have been no recent problems with coyotes and no problems at all with other cattle predators.

Recreation use of the Range is detailed on p. 2-41. Four areas of near-pristine black grama grasslands have been set aside and represent an area where the primary land-use objective is to promote research. These areas contain fine examples of native vegetation and associated wildlife habitat. Grazing is excluded from these areas, which are used as a natural laboratory by NMSU scientists. The location of the four areas is shown on Figure 2-9; approximately 4,000 acres of land are protected.

The potential exists for minerals development and more intensive outdoor recreation. However, no development is likely as long as the Range continues to have a primary military mission.

TRANSPORTATION

Access to the Co-use area is principally via New Mexico State Highway 506, a well-maintained dirt road entering the Range from U.S. 54 between El Paso and Alamogordo. In 1978, U.S. 54 carried an average of 2,414 vehicles per day through Orogrande. The 1978 average traffic count for New Mexico 506, between Orogrande and Pinon, was 54 vehicles per day (Wood, 1979). This represents about 550,000 vehicle miles per year. A major use of NM 506 is access to the Timberon recreational development, just northeast of the Co-use area. Many dirt roads and tracks intersecting NM 506 provide access to the grazing units. DOA and BLM blade these roads as needed. All access, including NM 506, is subject to occasional closing due to missile firings. These limitations apply to BLM personnel as well as to the general public.

SOCIO-ECONOMIC CONDITIONS

The annual income to BLM from forage sales has ranged between $119,000 and $238,000 in recent years, and is utilized for the management of the grazing program. This income is about 0.10 percent of the total personal income in Otero County. Existing benefits to all lessees are about $994,800 per year. In 1979-80, benefits to individual lessees will range from an estimated $24,336 to $274,800. The total benefits represent about 0.2 percent of the total value of New Mexico's beef industry, and 10 percent of the industry value in Otero County. Most of this income is received outside of Otero County, and most is earned outside New Mexico. In addition to grazing benefits, there are benefits related to wildlife and recreation, specifically hunting. Dollar value of these benefits is estimated at $62,900 per year.

There is no permanent population on the Range. Energy use associated with the grazing program is 2,800 gallons propane per year for well pumping plus an unmeasured use of gasoline for maintenance vehicles.

CHAPTER 3

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

CHAPTER 3. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

This chapter identifies and evaluates impacts to the human environment which would result from implementation of the proposed action. Basic assumptions and evaluation guidelines used in this chapter are listed below.

1. It is assumed that the proposed action would be implemented as described in Chapter 1.

2. Once the proposed action is implemented, the procedure described in Appendix B would be used to determine annual stocking levels and to make wildlife management decisions. Impact predictions are based on the concept that utilization of key forage species would be 50 percent, rather than on any specific value of animal unit months (AUMs) resulting from the proposed action.

3. Short-term impacts are those which would occur within five years of a particular action. Long-term impacts are those which would be present at the end of the 20-year period, when the objectives of the proposed action have been met. Unless otherwise stated, all impacts cited are long-term and would begin at the onset of the proposed action. These impacts would gradually increase over time. Estimates of the magnitude of the long-term impacts refer to probable conditions at the end of the 20-year period.

4. Technical references demonstrate that there is considerable variation in the response of vegetation and other resources to grazing and wildlife management programs. Scientific knowledge is not presently available to assess long-term impacts to the fullest extent. The techniques available for predicting impacts are not precise, but rather provide an indication of the type and general magnitude of expected changes. Although impacts are stated in quantitative terms where possible, the numbers given should be taken as an indication of approximate, not absolute amounts of change. Qualitative terms such as 'minor' and 'slight' are used when it is judged that an impact would likely be too small to measure readily.

5. Prediction of impacts on vegetation is based on interpretation of existing relationships between livestock and wildlife management and the environment of McGregor Range, and of relationships which are described in the literature.

6. Changes in vegetation will impact other resources. These impacts can be evaluated in a manner similar to the assessment of vegetation impacts.

VEGETATION

VEGETATION DYNAMICS

Existing relationships between vegetation and the environment of McGregor Range can be used as one basis for predicting how the vegetation would respond

to the proposed action (or alternative actions). A brief summary of the existing relationships is presented below, using data collected during the 1979 field season and information obtained from a survey of technical publications which discuss western U.S. rangelands. The field studies and literature search demonstrate that relationships between vegetation and different environmental factors are complex and variable. Historical changes in the plant cover are especially difficult to analyze in the study area, because detailed historical data on vegetation, climate, and grazing use are lacking. Consequently, the evaluation is subject to refinement by monitoring studies of the type incorporated into the proposed action.

Key forage species. The effects of grazing on vegetation can be monitored by observing key forage species. (Key forage species are plants which are readily utilized by grazing animals, reasonably abundant, and useful indicators of changes occurring within a vegetation type.) Changes in these species are considered to be reflective of a more general improvement or deterioration of the grazing resource.

The 1979 field survey identified the following as key forage species for cattle.

Mountain Foothills:	curlyleaf muhly; needlegrass; sideoats grama.
Canyonlands:	curlyleaf muhly; sideoats grama; mountain mahogany.
Mesa:	black grama; blue grama; sideoats grama; New Mexico feathergrass.
Rimlands:	black grama; blue grama.
Alluvial Fans:	tobosa; blue grama.
Bolson:	black grama; mesa dropseed.

Key forage species for deer include mountain mahogany, desert ceanothus, and apache plume. Too little is known about antelope ecology to identify key forage species.

Based on studies of the Jornada Experimental Range, cattle are likely to graze all of the plants on McGregor Range that are available to them, including forbs and half-shrubs (Herbel and Nelson, 1966). The perennial grasses (such as the gramas) are the major forage resource. Annual grasses and forbs have a production which is not as reliable as the perennials, but the annuals have a high nutritive value (Nelson et al., 1970). Most of the key forage species are palatable year-round, and receive continuous grazing, while other grasses (such as tobosa) are grazed during the relatively short period when they are actively growing, green and succulent. Deer utilize some of the forage grasses, but generally browse on shrubs. The antelope diet includes shrubs, grasses and some forbs; winterfat is probably important. Grazing animals prefer to use new growth on previously grazed plants, in preference to using plants which have not been grazed recently (Martin, 1978).

Except as discussed below, the key forage species are warm season plants. Growth of the warm season plants typically occurs in May-September. Most herbage is produced in the rainy months of July-September. Because the end of the

grazing season occurs before the rainy season, present grazing does not stress the key forage species during the critical growth period. When grazing begins again in October, most root and crown carbohydrates have been stored and the plants normally go into the grazing season in high vigor. In years of unusually early or late rainfall, grazing would be expected to overlap the main growing season. Many studies indicate that grazing season rest, which is the current practice on McGregor, is beneficial to the vigor and reproduction of the key species (for example, Miller and Donart, 1979). Because of these benefits, grazing programs which limit or exclude summer grazing would be expected to minimize adverse impacts on the key forage species. However, black grama requires a 16-month rest for effective reproduction (Paulsen and Ares, 1962).

Needlegrasses (including New Mexico feathergrass) are cool-season plants which begin growth in the fall and become quiescent in spring. The shrubs and forbs have their main growth period in the spring, if fall and winter moisture has been adequate. While winter and spring grazing is potentially detrimental to these species, the present levels of use produce no observable adverse effects. For example, needlegrass vigor and seedling establishment were excellent during the 1979 field season. Exceptions occurred in areas of non-grazing where needlegrass is dying in the center of clumps. The apparent cause of the decline in vigor in the non-grazed areas is the accumulation of litter, which prevents tillering except on the outermost part of the clump. This observation is a strong indication that feathergrass is not limited by existing livestock grazing and would not increase if cool-season grazing were to be eliminated. As another example, shrubs in areas of greatest deer density in the Mountain Foothills and Canyonlands generally show no evidence of close browsing. Instead, plants known to be important in the deer diet are in high vigor. Direct evidence regarding forbs utilized by antelope is not available, since many of these cool-season plants were not present during the late summer field season. However, based on the overall condition of forage plants, these species would be unlikely to be stressed by existing levels of utilization.

Increaser species. Range management also is concerned with widespread species which are of limited value as forage. In a grazed area, an increase or invasion of these low-value species often is taken as evidence of overuse of the forage resources. On McGregor Range two such species are especially widespread and deserving of study as possible indicators of grazing pressure: creosotebush and broom snakeweed. Both are part of the natural vegetation of the area and therefore are increasers rather than invader species.

Effects of climate and soils. Natural factors, especially climate and soils, have the most influence on the vegetation of McGregor Range. Climate and soils are the major controls of vegetation distribution. Climate is the primary factor determining changes in vegetation over time.

At lower elevations in the area, the native plant communities are adapted to arid conditions. The communities generally produce limited amounts of desirable forage and are very susceptible to deterioration if disturbed. At higher elevations, the greater availability of moisture tends to result in higher forage yields, and a greater stability. Since moisture conditions also

relate to soil type and topographic position, many variations in vegetation correlate with soil and slope characteristics. For example, on Otero Mesa, feathergrass and sideoats grama tend to be found on gravelly ridges while tobosa is found in the moister swale areas. In the Canyonlands the moister sites contrasts with drier sites by having more curlyleaf muhly and goldeneye and less mariola and sideoats grama.

The long-term effects of variations in climate can be deduced from studies of the Jornada Experimental Range (23 miles northeast of Las Cruces) and from research on other rangelands. On the Jornada, severe droughts have caused reductions in the basal cover of black grama to about the same amount regardless of grazing intensity (Paulsen and Ares, 1962). During wet periods, the basal cover has recovered to a similar degree on all but heavily grazed pastures. Increases in vigor, basal area, and stored foods in black grama occurred whenever there was substantial, well-timed precipitation throughout a 15-month period (two growing seasons), regardless of grazing intensity. Data presented in Paulsen and Ares (1962) indicate that, typically, one inch of summer rain produced 120 pounds of black grama herbage. Rain from July to early August was more effective than rain at other times. Similar relationships between good rainfall and improved cover and productivity are reported in other studies (for example, Martin and Cable, 1974). In years of little or no rainfall there is little significant growth of the forage grasses (Culley, 1943). The relationships are affected by many other factors. At best the prediction of forage production based on weather has no better than a 75 percent chance of being correct (Heady, 1975).

The importance of nonclimatic factors is cited in many references. On the Jornada, increases of broom snakeweed in the grama pastures occurred in response to the combined effects of drought and heavy grazing (Campbell and Bomberger, 1934). Mesquite and creosote increases were influenced by climate (Wedel, 1957; Buffington and Herbel, 1965; Herbel, 1965; Hastings and Turner, 1965), reductions in natural wild prairie fires (Humphrey, 1952; Humphrey and Mehrhoff 1958; Buffington and Herbel, 1965; Brown, 1950) and the competitive advantage held by shrubs which reproduce by an effective seed-dispersal mechanism (Buffington and Herbel, 1965). The main increases were on sandy (mesquite) and gravelly (creosote) soils. Valentine and Gerard (1968) found that creosote increases have been influenced more by microclimate and soil stability than by grazing pressure . They found no evidence of a positive correlation between range condition and establishment of creosote. The drought resistance of creosotebush is a major factor influencing its increase. Because of its competitive advantages, control of creosote is extremely difficult by grazing management alone.

Effects of livestock grazing. The 1979 field studies demonstrate that grazing has the following effects on vegetation in the existing pastures.

1. Forage utilization decreases markedly with increasing distance from water facilities. This relationship is described in more detail on page 3-7, with reference to Table 3-2. Similar relationships on the Jornada Range were described by Campbell (1943), who found that the

utilization of black grama decreased with distance at the rate of 10 percent a mile up to 3.5 miles.

2. Areas of greater utilization sometimes have different species composition and a lower productivity than areas with less utilization. For example, field surveys in pastures 10, 11, and 12, where black and blue grama are dominant, showed that the proportion of blue grama increases as utilization increases because the black grama is more heavily grazed. In lightly grazed areas far from water, grass heights are commonly about 20 inches.

3. Areas of little or no utilization may produce more herbage than those with moderate grazing, but are also likely to contain plants which are declining in vigor due to the accumulation of litter. This point is illustrated in Table 3-2, and in the discussion of needlegrass (p. 3-3). On the Jornada, maximum vigor and basal cover of tobosa were associated with intermediate levels of grazing (Paulsen and Ares, 1962). The stagnation of plants which are protected from grazing is also discussed by Marshall (1975) and Weaver and Roland (1952).

4. Grazing and trampling have caused a deterioration in rangeland condition near permanent water facilities and in the arroyos of the Canyonlands.

5. There is an apparent lack of correlation between livestock grazing and the presence or absence of low-value species such as broom snakeweed and creosote. This is illustrated by Table 3-1, and by the discussions on pages 3-6 and 3-9. Thus, protection of grasses from grazing does not ensure protection against the invasion of shrubs and half-shrubs (Hastings and Turner, 1965; Pettit, 1979; Jameson, 1970; Smith and Schmitz 1966; Ragsdale, 1969).

6. The relationship between ground cover and utilization is complex. In general the field team observed that basal cover was greater on moderately grazed grassland pastures than on pastures which experienced less utilization. The greater basal cover occurred because the grasses tended toward sod formation; in lightly used areas the grasses occurred in distinct upright clumps. Similar relationships have been reported by many other studies (for example, Klipple and Costello, 1960; Valentine, 1970). However, in other cases basal cover is greater where lands have little or no grazing (Potter and Krenetsky, 1967). Field observations indicated that canopy cover decreased as grazing increased, which is consistent with literature reports. The overall effect of utilization varied, but generally had little impact since increases in basal cover tended to balance decreases in canopy cover.

During the 1979 field studies, two types of observations were made for the specific purpose of quantifying the relationship between grazing utilization and vegetation characteristics. One type of research involved comparisons be-

tween land which is lightly grazed and adjacent areas where grazing has been excluded for many years. The second investigation concerned changes in vegetation along transects away from water supplies.

The grazing/no-grazing comparisons were made in two areas where a grazed pasture adjoins one of the black grama exclusions being studied by New Mexico State University (NMSU). The results of the field work are given in Table 3-1.

TABLE 3-1. COMPARISONS BETWEEN GRAZED AND NON-GRAZED AREAS.

A. Grazed plot (slight utilization) in Pasture 7; adjacent non-grazed plot in black grama exclusion, north of Highway 506. Values represent herbage production in grams, from a 4.8 square foot quadrat. Litter cover was 35.8% in the non-grazed area, 6.3% in the grazed area.

Plant Species	Non-Grazed Area	Grazed Area
Forbs	16.9	4.9
Black grama	16.9	8.0
Blue grama	8.2	9.1
Ring muhly	-	.8
Sideoats grama	-	Tr
Vine mesquite	-	Tr
Tobosa grass	-	2.6
Sand dropseed	.4	-
Threeawn	.4	-
Burrograss	.4	-
Hall's panicum	-	Tr
Curlyleaf muhly	3.5	-
Broom snakeweed	4.6	1.2
Winterfat	7.2	-
Creosotebush	1.2	-
TOTAL (excluding creosote)	58.5 (1168 pounds/acre)	24.6 (492 pounds/acre)

B. Grazed plot in Pasture 9 (light utilization); non-grazed area in black grama exclusion to west. Litter cover was 9.8% in non-grazed plot; 11.1% in grazed plot.

Species	Non-Grazed	Grazed
New Mexico feathergrass	3.3	14.1
Black grama	22.9	.4
Blue grama	4.3	1.0
Sideoats grama	5.4	.4
Hairy grama	3.4	3.5
Threeawn	1.4	-
Forbs	2.3	6.1
Broom snakeweed	6.5	2.3
TOTAL (excluding snakeweed)	43.0 (860 lb/acre)	25.5 (510 lb/acre)

Source: 1979 field studies (Pettit, et al., 1980).

The findings of the comparison study are summarized as follows.

1. More herbage was found in the nongrazed than the grazed areas.

2. In one of the comparison areas, litter was much more abundant in the nongrazed portion. In the other comparison area, litter was more abundant on the grazed portion.

3. Black grama was observed to be a decreaser species, i.e. less common in the grazed areas. In one site, needlegrass was a prominent increaser species.

4. Plants with limited forage value and utilization (creosotebush, broom snakeweed) are just as common in the protected areas as in the grazed areas.

5. Forb production responded favorably to nongrazing in one comparison area, and to grazing in the other area.

The study of forage utilization as related to distance from water was made to test the suitability criteria that suggest cattle will move up to 4 miles from water on smooth topography. Transects were run from water to distances 2 or more miles away from water in the following locations: northwest of Double Tank (Pasture 9); southwest of Double Tank to Broke Tank (Pasture 9); and south-southeast of Mary Toy well and tank (Pasture 11). At each 0.1 mile along each transect a 100-square-foot plot was laid out. Within the plot estimates were made of utilization, hummocking of plants, presence of manure (evidence of livestock presence), litter cover, and range condition. The species composition and soil conditions were recorded. Because no single discrete plant community was found on all plots, special care was used in interpreting the plots to prevent bias resulting from changes in forage preference.

The two transects from Double Tank produced somewhat complex results because of the overlap of cattle movement from other water facilities. The transect from Mary Toy was toward a boundary fence so that relatively straightforward results were obtained. Table 3-2 presents the results of the Mary Toy transect. The transect followed a gentle slope until about 1.5 miles from the tank, then a steeper (but still moderate) slope until the fence was approached at 3 miles. The data suggest that cattle movement was restricted to within 1.5 to 2 miles of the water. Beyond that distance, utilization was minimal and litter accumulation was significant. The observed utilization decreased 20 percent per mile. Plant hummocking, considered by many to be an indicator of range deterioration, showed no relationship to litter cover or degree of utilization. Broom snakeweed was a community dominant in the area near water, as would be expected from its supposed association with the more heavily grazed lands. However, it was also a common community component three miles from water, where little or no cattle grazing had occurred. Similarly, at 2.5 miles from water Russian thistle seedlings were numerous, while nearer water only occasional examples were observed. This pattern was not related to soil disturbance.

TABLE 3-2. FORAGE UTILIZATION AS RELATED TO DISTANCE FROM WATER.

Transect SSE of Mary Toy. lt = less than. GL = gravelly loam. VGL = very gravelly loam.

Distance from water (miles)	Plant community	Slope	Litter cover	Avg degree of plant hummocking	Cow manure	Utilization of herbage	Soil	Evidence of burning
0.1	Broom snakeweed-blue grama	N 3°	lt 5%	1/2 inch	0	heavy	loam	no
0.2	Broom snakeweed-black grama	N 3°	5%	1/2 inch	1	heavy	loam	no
0.3	Broom snakeweed-burrograss	N 3°	5%	1/2 inch	0	heavy	loam	no
0.4	Broom snakeweed-blue grama	N 3°	5%	1/2 inch	0	moderate	GL	no
0.5	Broom snakeweed-threeawn	N 3°	lt 5%	1/2 inch	0	moderate to heavy	GL	no
0.6	Broom snakeweed-threeawn	N 3°	lt 5%	1/2 inch	1	moderate	GL	no
0.7	Broom snakeweed-blue grama-black grama	N 3°	8%	1/2 inch	0	moderate	GL	no
0.8	Broom snakeweed-black grama-blue grama	N 2°	5%	1/2 inch	0	moderate	GL	no
0.9	Broom snakeweed black grama-blue grama	N 1°	lt 5%	1/2 inch	0	moderate	VGL	no
1.0	Broom snakeweed-threeawn	Flat	lt 5%	1/3 inch	0	moderate to light	cobbles on loam	no
1.1	Broom snakeweed-blue grama-black grama	Flat	lt 7%	1 inch	0	moderate	GL	no
1.2	Broom snakeweed-black grama	SE	5%	1-1/2 inch	0	moderate	GL	no
1.3	Tobosagrass	Flat	lt 1%	1/2 inch	5	moderate-heavy	silty clay	no
1.4	Black grama-blue grama	NW 6°	lt 5%	1 inch	0	light	loam	yes
1.5	Blue grama-muhly	NW 5°	lt 5%	1-2 inches	0	slight	GL	yes
1.6	Blue grama-burrograss	NW 5°	lt 5%	1/2	0	light	GL	no
1.7	Blue grama-burrograss	NW 7°	lt 5%	1/2-2 inches	1	light	GL	no
1.8	Burrograss-bluegrama	NE 7°	10%	1/2 inch	1	moderate	loam	no
1.9	Blue grama-black grama	NE 8°	lt 5%	1-3 inches	0	slight	loam	yes
2.0	Broom snakeweed-blackgrama	NE 10°	lt 5%	1-2 inches	0	slight	GL	no
2.1	Broom snakeweed-black grama	NE 1°	12%	1 inch	0	light to none	GL	no
2.2	Soaptree yucca-black grama-blue grama	NE 1°	15%	1-2 inches	0	none	GL	no
2.3	Black grama	Flat	20%	1-3 inches	0	none	GL	no
2.4	Soaptree yucca-blue grama-threeawn	Flat	12%	1 inch	0	none	GL	no
2.5	Blue grama-burrograss	N 1°	lt 5%	1-2 inch	0	none	GL	yes
2.6	Blue grama-black grama	N 1°	12%	1/2-1 inch	0	none	GL	no
2.7	Black grama-blue grama	N 1°	15%	1/2-1 inch	0	none	GL	no
2.8	Black grama-blue grama	N 1°	15%	1/2-1 inch	0	none	GL	no
2.9	Black grama-burrograss	N 1°	10%	1/2-1	0	none	GL	no
3.0	Blue grama-burrograss	N 1°	18%	1/2-1	0	none	GL	no

Source: 1979 field studies; Pettit et al. (1980)

Effects of other factors. Under present conditions the wildlife and vegetation components of the environment appear to be in balance. Wildlife utilization is not placing a stress on the vegetation resource. Since overall utilization of forage by all grazing animals is only about 34 percent, there is no conflict associated with livestock and wildlife use of forage. However, in the Bolson area and the northern parts of the Mesa it is possible that rodents and rabbits are a factor (along with soil and climate limitations) which would slow or prevent improvements in range condition (see discussions in Norris, 1950, and Arnold, 1942).

Fire is a significant ecological element on southwestern rangelands, and is a natural component of the climax ecosystem (Daubenmire, 1968). Wright (1969) has shown that in west Texas the absence of fire in tobosa and juniper communities severely limits forage production. On McGregor wildfires have had the following effects: reduction in litter; improved vigor of grass species; increase in cattle utilization; reduction (to some extent) of shrubs such as cholla, soaptree yucca, creosotebush and broom snakeweed; greater productivity on burned sites (at time of 1979 survey); and less cover (more bare soil) on burned sites. Similar effects are reported in other areas (for example Reynolds and Bohning, 1956). These effects of fire are beneficial from the point of view of supporting livestock use of the Range, as evidenced by preference of cattle for the burned over the unburned areas. With heavy grazing, the depletion of fuel is associated with a decline in fire frequency.

As described on pp. 3-3 to 3-7, the presence of creosote and broom snakeweed on McGregor Range reflects natural processes and controls as much (or more) than grazing. Where these plants occur they outcompete grasses and other key forage species. Thus natural processes would be unlikely to allow the affected areas to reach their potential as a forage resource. In areas containing broom snakeweed, the vigor of the associated grasses is observed to be less than vigor in grassland communities.

At present the location of fences does not appear to have a major impact on vegetation. Cattle trailing and consequent deterioration of the Range were not observed. Except for the effects of burning, and the very localized consequences of missile impacts, adverse impacts from military uses of the Range are not apparent. However, no data on cattle mortality are available to verify that animal well-being is not at risk from the military activities.

TYPES OF IMPACTS

The proposed action would alter vegetation through construction of improvements, development of new water facilities, and management to allow greater utilization of key forage species. In order to relate these actions to impacts on utilization, production, condition, cover, and other measures of the vegetation resource, it is necessary to recognize that the proposed management program would lead to a change in the distribution of grazing animals (especially cattle), and a substantial increase in forage utilization. It is the altered distribution and increase in AUMs which will actually cause most of the changes in vegetation. Although the impacts are discussed separately, the effects of

different elements would be interrelated and the net impact would reflect all aspects of the proposed action. The impacts are described in terms of the entire vegetation resource, with specific consideration of effects on utilization, herbage production, condition, trend, cover, and vigor. Actual effects would vary among communities and species (Gifford and Hawkins, 1976).

Distribution. The improvements would provide reliable water in areas which are now lightly grazed. Periodic closing of water facilities would force animals to move to open supplies. The new improvements, and the practice of rotation, would reduce grazing pressure near existing water, increase grazing near new water, and lead to a more even distribution of animals overall. In the Mountain Foothills and Canyonlands, new water would increase the amount of land rated as suitable for livestock grazing (see section on Land Use), and would therefore open up new areas where cattle would be able to utilize forage vegetation.

Increased AUMs. Utilization would be greater than now occurs, and would allow an increase in AUMs (see next section). The increase would be gradual, as new water supplies are developed (Figure 1-3). Table 3-3 provides estimates of the AUMs which would result from the proposed action. Actual numbers could be higher or lower in individual years, depending on precipitation and forage production (see also item 2, p. 3-1). Table 3-3 is based on many assumptions. The most important are:

1. the herbage yield measured in 1979 is assumed to be equal to the long-term herbage production which would occur if no changes in utilization took place;

2. the long-term herbage yields would be reduced in individual pastures in proportion to increases in utilization and AUMs (see section on Productivity);

3. 50 percent utilization of key forage species is assumed to cause 50 percent utilization of the entire herbage resource;

4. cattle are able to use any herbage which is not required to support existing or projected wildlife needs (see section on Wildlife), and which is not located in an area rated as unsuitable for livestock (see section on Land Use).

More information on these assumptions is presented in Appendix C (p. A-14). The Appendix contains a detailed explanation of the procedures used to develop Table 3-3.

The AUM projection is provided for purposes of determining if the proposed action is likely to meet the stated objectives. The numbers are approximate, and probably conservative. The Table does not represent an allocation of forage, since data adequate for forage allocations are not available. As the table indicates, livestock AUMs would equal 57,230 per year. Deer and antelope AUMs would equal 4,032 per year. This would bring the total AUMs (exclusive of

TABLE 3-3. APPROXIMATE ANIMAL UNIT MONTHS (AUMS) UTILIZED IF PROPOSED ACTION WERE IMPLEMENTED.

1 PASTURE	2 ACRES	3 EXISTING HERBAGE YIELD LBS/ACRE/YR	4 EXISTING AUMS AVAILABLE	5 EXISTING WILDLIFE AUMS	6 EXISTING CATTLE AUMS	7 PROJECTED HERBAGE YIELD LBS/ACRE/YR	8 PROJECTED AUMS AVAILABLE	9 PROJECTED DEER AUMS	10 PROJECTED ANTELOPE AUMS	11 PROJECTED AUMS LEFT FOR WILDLIFE	12 PROJECTED CATTLE AUMS	13 PROJECTED CHANGE IN CATTLE AUMS
1. Langford	31,000	333	5,162	246	2,326	250	3,875	103	0	228	3,544	+ 1,218
2. Cox Well	25,000	400	5,000	182	1,578	300	3,750	83	0	168	3,499	+ 1,921
3. Culp	32,000	433	6,928	1,186	2,752	405	6,480	1,081	0	1,223	4,176	+ 1,424
4. Lee	13,000	738	4,797	662	1,798	701	4,557	645	0	1,542	2,370	+ 572
5. Cressgarden	20,000	735	7,350	838	2,120	662	6,620	893	0	2,502	3,225	+ 1,105
7. Rutherford	19,000	418	3,971	191	2,585	402	3,819	104	0	190	3,525	+ 940
8. Oaggar	17,000	534	4,539	335	2,362	480	4,080	301	4	462	3,313	+ 951
9. Mesa Horse Camp	31,000	641	9,936	135	7,490	577	8,944	103	123	72	8,646	+ 1,156
10. Wingfield	12,000	814	4,884	57	3,780	814	4,884	40	36	36	4,772	+ 992
11. Mary Toy	18,000	514	4,626	81	4,220	514	4,626	60	64	48	4,454	+ 234
12. Herd	8,000	546	2,184	41	2,093	546	2,184	27	32	24	2.101	+ 8
13 Martin Tank	20,000	677	6,770	96	4,090	575	5.750	74	76	48	5,552	+ 1,462
14. Antelope	12.000	746	4,476	49	2,562	671	4,026	40	48	24	3,914	+ 1,352
15. Shiloh	13,000	819	5,324	62	2,304	655	4,258	43	52	24	4,139	+ 1,835
TOTAL	271,000	560	75,947	4,161	42,060	502	67,853	3,597	435	6,591	57,230	+15,170

Source: Methodology for development of the this table is described in Appendix C

use by other wildlife) to 61,262 per year, which would meet the objective of 60,000 AUMs. In actual practice, stocking rates will be determined annually by the Bureau of Land Management (BLM), using the monitoring procedure described in Appendix B. The actual AUMs associated with the proposed action will depend on climatic conditions and observation of forage utilization and range conditions, not on the generalized values given in Table 3-3.

UTILIZATION

The proposed action would allow animals to utilize virtually all of the 14 pastures, including areas now lightly grazed. This would occur because presently lightly grazed areas would be closer to water; water supplies not needed by wildlife would be closed periodically to ensure that cattle move to a neighboring supply; and animals would have to move at least 0.5 miles from water to obtain salt.

Inspection of the existing pastures indicates that it is common for a given water supply to have an effective radius of influence of about 2 miles. That is, at distances greater than 2 miles cattle are likely to go to a closer water supply. A water supply with a 2-mile radius of influence, and a utilization pattern as described above, would service a 12.6 square mile area which had an average utilization of 34 percent. (Refer to Appendix C, p. A-14 for sample calculation.) This is consistent with the data given in Table 2-4, which indicates that nearly three-fourths of the area in the 14 pastures is in the light (20 to 40 percent) utilization category.

Inspection of maps indicates that the effective radius of influence of a typical water supply would be 1.5 miles or less if the proposed action is implemented. If the pattern of forage utilization were to parallel that observed on the Jornada Range (see p. 3-4), a ten percent decrease in utilization of key species such as black grama would be observed per mile of distance from water. A typical water supply would service a 7.1 square mile area. The area would have an average utilization of 50 percent. (Refer to Appendix C. p. A-14 for sample calculation.) The 50 percent utilization value would apply to key forage species. Slightly less utilization (40 to 45 percent) would occur for the forage resource as a whole. Data are not available to determine the exact level of utilization which will occur. AUM calculations are based on 50 percent utilization of the entire resource. Refer to Appendix C (p. A-15) for a discussion of the rationale for the AUM calculation procedure.

Table 3-4 indicates the acreage in different utilization classes which would result from the proposed action. The estimates are based on assumptions cited in Appendix C (p. A-14). Overall, utilization in the 14 pastures would change from light to moderate.

The prediction that utilization will become more even is supported by many publications. Improvements in animal distribution related to the rotation of access to water are discussed in Martin and Ward (1970), Reynolds and Martin

TABLE 3-4. CHANGE IN CONDITION AND UTILIZATION.

PASTURE Number, acres	CONDITION (acres changing to lower class)	UTILIZATION Heavy	Moderate	Light	Slight
1. 31,000	125	280	29,318	280	1,122
2. 25,000	200	200	24,600	200	0
3. 32,000	1,900	2,380	22,240	2,380	5,000
4. 13,000	1,400	1,660	9,225	1,660	455
5. 20,000	100	800	15,000	800	3,400
7. 19,000	75	550	2,452	15,960	38
8. 17,000	75	585	15,651	585	179
9. 31,000	125	745	29,510	745	0
10. 12,000	100	340	11,320	340	0
11. 18,000	25	565	16,870	565	0
12. 8,000	50	490	7,020	490	0
13. 20,000	125	925	18,150	925	0
14. 12,000	75	75	11,850	75	0
15. 13,000	50	505	11,990	505	0
	4,425	30,100	225,196	25,510	10,194

Source: Based on 1979 field studies by Lee Wilson and Associates.

(1968), and Talbot (1926). The effects of salt location were evaluated on the Jornada Range by Ares (1953), who found that placement of salt in areas of abundant forage reduced utilization near water and increased it by as much as 10 to 15 percent at a 3 mile distance. The Jornada program is based on placement of several salt grounds at one to four miles from water. The proposed action may have less effect, because salt would be one-half mile from water.

The desirability of a more even utilization is well-documented in the literature. For example, the Arizona Interagency Range Committee (AIRC) observed that cattle are capable of efficient harvesting of forage, if properly distributed. Forcing livestock to graze when and where they should is necessary if long-term productivity is to be maintained (AIRC, 1973). Similar observations were made by Reynolds and Martin (1968) and Martin (1978).

PRODUCTIVITY

The production of herbage within the Co-use area would be reduced because of the direct removal of plants at construction sites, and because of the long-term effects of increased forage utilization.

Direct effects of construction. Construction of improvements would cause disturbance or removal of vegetation on 118 acres (Table 1-4). The acreage affected by individual types of improvements is listed in Table A-1. The loca-

tion of the affected sites is shown on Figure 1-4. Pipeline construction would impact 21 acres. As on existing pipeline routes, the sites would be covered by weeds in the growing season after construction and would gradually progress toward climax vegetation. Consequently, no significant change in long-term production would occur. The remaining 97 acres would be modified by improvements or would undergo continuing disturbance by concentrations of animals, vehicle traffic or periodic inundation by water. The areas would be expected to remain bare, or to contain limited vegetation in poor condition. The 97 acres would no longer be available to support livestock or wildlife. The acreage would represent 0.02 percent of the Co-use area.

Effects of increased AUMs. Based on the literature, herbage yields are often greater in areas subject to light grazing than where grazing is either greater (moderate) or less (very slight or none). References which discuss this subject include Canfield (1939), Johnson et al. (1951), Pond (1957), Lewis et al. (1956), Smith (1967), Klipple and Bement (1961), Hanson et al. (1970), Reardon and Merrill (1976), Hanson et al. (1978). Because of this relationship, the projected increase in utilization would be expected to reduce productivity within the 14 pastures. The decreased production represents vegetation which would otherwise be recycled through the ecosystem, and which would contribute to the build-up of litter and organic matter in the soil. The change would not represent a reduction in food needed by wildlife or cattle, but in fact would be a necessary consequence of increasing the amount of food actually provided to these animals. Productivity data obtained from the 1979 field studies on McGregor demonstrate differences in herbage yield among the many different plant communities, but do not allow detailed interpretation of use-related variations within communities. However, the data are consistent with the conclusion that a change from light to moderate grazing would result in a reduction of plant productivity.

The literature indicates that herbage yields under moderate grazing are often from 0 to 50 percent less than productivity under light grazing. A value of ten percent is representative of the average difference (decrease) described by these references. It is assumed that the decrease on McGregor would not exceed a value of 10 percent, because the proposed action would continue to include growing-season rest for the majority of the key forage species, and would thus tend to have less of an impact than that typically reported in the literature. Nevertheless, some changes would be expected due to increased trampling and associated changes in the soil microclimate. The changes would be partially and perhaps completely offset by increased productivity away from water, associated with improved vigor near new water facilities (see p. 3-18).

Although the actual reduction in productivity may be quite small, for purposes of a conservative (worst-case) evaluation of impacts a 10 percent decrease in production is assumed. Herbage yields within the 14 pastures would change from 560 pounds per acre at present to about 502 pounds per acre by the end of the 20-year project period. The pastures which are now the least utilized (see Table 2-4), and which would sustain the greatest increases in AUMs, would be expected to experience the greatest reduction in herbage yield if the proposed action is implemented. To predict changes in each pasture, the

methodology described in Appendix C (p. A-14) was used. This method distributes the anticipated ten percent reduction in overall production to individual pastures in proportion to the anticipated increase in AUMs. Table 3-3 lists the forage production which would be expected to occur in each pasture by the year 2000. Because of the variability in the response of vegetation to grazing, and since the method used did not take into account the different responses of different plant communities, the changes indicated by Table 3-3 should be considered as an approximate measure of the worst-case impact.

CONDITION AND TREND

The proposed action would benefit range condition near existing water facilities, cause some adverse changes near new water supplies, and generally maintain the existing situation elsewhere on the Range.

Existing water facilities. Because livestock numbers would be reduced near existing water, there would be reduced forage utilization and trampling in the 25-50 acres of poor condition land which surrounds each water facility (100-200 acres in the Mountain Foothills and Canyonlands). These areas (4,400 total acres) currently have a downward trend in condition. Reduced grazing pressure would be expected to slow the downward trend. Existing deterioration in forage production, cover, and vigor would slow. Because livestock concentrations would remain substantial, a reversal toward an upward trend would not be expected.

New water facilities. Near new troughs, land which is now lightly grazed would be subject to heavy forage utilization and trampling. Based on comparisons to existing facilities, an area of 25 to 50 acres around each supply would be likely to develop a downward trend in range condition. In the Mountain Foothills and Canyonlands, the effect would occur over a 100 to 200 acre area per facility, concentrated in drainageways. This impact occurs because of the tendency for livestock to concentrate near water; similar patterns are observed elsewhere, such as on the Jornada Range (Campbell, 1943). The impact would be unavoidable except through implementation of very complicated and expensive management programs of the type described by Savory (1978). It would be mitigated in the upland areas by the stocking of yearlings, which are more able to gain access to forage in sloping areas. Similar effects are observed on the Jornada Range (Paulsen and Ares, 1962).

Near existing water, vegetation is currently rated one or two condition classes lower than the surrounding areas. The prospective grazing near new water is less intensive than the grazing near existing water. Therefore, the change in condition class at new troughs would be expected to be less than now observed. It is assumed that the change would be one condition class, and that this change would occur over a 25 acre area per facility (100 acres in the upland units). For example, near a typical new water facility on the Mesa, an area of 25 acres of good condition range would change to fair condition. In the affected acreage, forage utilization and trampling would be expected to

cause impacts similar to those observed near existing water: reduced forage production, increased bare ground, a decline in plant vigor, and an increase in plants with limited forage value.

Table 3-4 lists the acres of land in each pasture that would be expected to change in condition if the proposed action is implemented. The total impact of the proposed action would be to cause about 4,425 acres of land to change by one condition class downward. This represents less than two percent of the area in the existing pastures, and less than one percent of the Co-use area.

The effects of the increased livestock numbers would be most evident within 2 miles of new water facilities, in areas which are now lightly grazed. The increase in livestock numbers in itself would be expected to result in a more even distribution of grazing, since cattle would be forced out from water to find forage (Campbell, 1943; Ares, 1953).

Rangewide. Based on the literature, grazing at a level of moderate utilization normally results in a vegetation resource which sustains its productivity and vigor over the long term, without any deterioration in condition (Lewis et al., 1956; Martin, 1975). Maintenance of good condition range also derives from management which includes growing-season rest, adjusts stocking levels in response to variations in climate (especially drought), and allows adjustment of stocking levels in the event that adverse impacts to vegetation are observed (Martin and Cable, 1974; Nelson, 1934).

The proposed action involves moderate utilization of forage, growing-season rest, and flexibility to adjust stocking levels. Based on the literature cited above, the increased number of AUMs would not be expected to cause any change in condition classification away from water supplies. Nonetheless, some changes in species composition could occur without causing a change in condition class. For example, a given species might increase or decrease in abundance by a few percent. Changes of this type would be expected in areas which change from light (or slight) to moderate utilization. For example, the abundance of sensitive species such as black grama would decrease in any area where utilization is significantly increased, even though the overall rating of condition did not change.

POISONOUS PLANTS

The 1979 field studies indicate that the presence of toxic plant species on McGregor Range was not systematically related to grazing pressure. In the Bolson some poisonous plants are more numerous around watering facilities, but in other areas (such as Pasture 2) good vegetative cover and nongrazing have not prevented these undesirable plants from growing. Poisonous species would be expected to increase near new water facilities, especially in the Bolson unit. Data are not available to quantify this change, but a maximum of 4,425 acres would be affected.

THREATENED OR ENDANGERED PLANTS

As described on p. 1-10, BLM has consulted with the Fish and Wildlife Service (FWS) regarding threatened or endangered species, as required by the Endangered Species Act. BLM will prepare a biological assessment of the effect of the proposed action on the endangered Kuentzler hedgehog cactus. The species is a large, bushy cactus which should not be affected by moderate grazing (Champie, 1980).

OTHER IMPACTS

The proposed action would be expected to affect plant cover, vigor, the production of litter, and the frequency of fires.

Cover. Both canopy and basal cover would be affected by the proposed action. The principal impact would occur in the 4,425 acres of land near new water, on which condition is expected to decrease by one class. In this area the change in utilization would generally be from light to heavy. A review of the literature suggests that such a change could cause a substantial decrease in plant density, especially canopy cover. References which discuss the complex relationships between cover and utilization include Canfield (1939), Johnson et al. (1951), Lewis et al. (1956), Pond (1957), Klipple and Costello (1960), Cook and Stoddart (1963), Hanson et al. (1970), Smoliak et al. (1972), Smith and Schmutz (1975), Hanson et al. (1978).

Although the cover-utilization relationships vary considerably depending on the environmental conditions studied, a typical comparison suggests that plant cover on heavily grazed areas is 50 percent less than cover on lightly utilized areas. This relationship is not necessarily different under different grazing systems, such as growing-season rest versus growing-season use.

Field observations during 1979 suggest that this relationship is at least approximately correct within the Co-use area. That is, heavily grazed areas near water often have a plant cover which is about half as dense as the cover which occurs in the same vegetation type at locations farther from water. The difference in cover relates to a substantial decrease in the canopy layer as grazing use increases. Basal cover may actually be slightly greater on the heavily grazed areas, due to the tendency for increased use to cause an increase in the importance of short grasses, and a change in grass form from distinct clumps to sod forms. Based on the literature and field studies, the 4,425 acres near new water facilities would be expected to experience a substantial decrease in canopy cover, and a net decrease in plant density of as much as 50 percent.

On areas near existing water facilities, canopy cover should be increased somewhat. Data are not available to quantify this impact, but the change would be small since grazing would remain heavy near these water supplies. On most of the area in the fourteen pastures, cover would not be expected to change greatly. These areas will experience an increase in utilization from light to moderate. The literature cited above suggests that, on balance, a change of

this type may cause a decrease in canopy cover and an increase in basal cover. The net effect is variable, depending on which of the changes is more significant. On the Jornada, black grama density is greatest under moderate grazing (Valentine, 1970). The effects of grazing (versus non-use) are to produce smaller, more evenly distributed plants (Paulsen and Ares, 1962). The 1979 field studies suggest that the same pattern occurs on McGregor. Further, differences in plant cover between moderately and lightly utilized areas are small. While canopy cover may be reduced by increased utilization, basal cover can be expected to increase due to sod formation. The net change is difficult to predict even as to direction. Nonetheless the change is expected to be small and probably not measurable. For practical purposes it is appropriate to conclude that there will be no net impact on cover conditions in areas which are not adjacent to water supplies.

The net effect of the proposed action, then, is a 50 percent decrease in cover on 4,425 acres, and little or no change on the remaining 510,575 acres within the Co-use area. In terms of increased exposure of soil, this is equivalent to a 0.5 percent decrease in cover over the entire 515,000 acres of the grazed area. Based on information summarized in Table 2-3, existing cover averages 20.5 percent for the 14 pastures. Assuming that this percentage applies rangewide, a 0.5 percent decrease would change the cover to 20.4 percent of the ground surface. That is, 20.5 x 0.005 = 20.4. This change would not be detectable in any type of rangewide monitoring program.

Vigor. The continued practice of growing-season rest would allow most forage species to go through their growth cycle largely undisturbed, thus promoting a high level of vigor. Where livestock graze areas which are now lightly utilized, the proposed action would improve the vigor of many forage species. This benefit, which would affect both cool-season and warm-season plants, would occur for two reasons. Vegetation which is now stagnant due to non-use would be cropped, stimulating new growth, and litter production would decline, permiting increased tillering (Weaver and Roland, 1952; Weaver and Albertson, 1956; Martin, 1978). The increased vigor would result in plants which would be more succulent, palatable, and productive. This would attract livestock to the newly grazed areas, which would further encourage utilization and reinforce the measures taken to improve animal distribution. The improved vigor would potentially offset some of the predicted decrease in productivity.

Litter, fire. The increased utilization of forage would substantially reduce the amount of litter and standing dead material, even if the predicted changes in productivity are less than stated in the worst-case analysis. Based on field data (see Table 3-2), and on the literature (for example Hanson et al., 1978), the change from light to moderate utilization may decrease litter by as much as 50 percent. With less dead material available, the amount of exposed soil would be increased. Also, the amount of fuel for fires would be reduced. This would result in less acreage being burned each year by natural and military-related fires. Information is not available to quantify the change in fire frequency. Shrubs and cacti which are intolerant of fire would be favored by the reduction in fire. Species which are more productive where fires are common (such as tobosa) would be adversely affected (Wright, 1969; Dwyer, 1972).

Increaser Species. Although condition would not change markedly, shrubs and weeds would continue to be abundant in many locations. Broom snakeweed would be likely to continue the natural cycle of growth and decline described by Jameson (1970) and creosotebush would expand where soil and climate conditions are favorable (Valentine and Gerard, 1968). Conditions favorable to creosotebush increase are especially common adjacent to the upper Alluvial Fan unit (see p. 2-14). These changes could cause range condition to be rated as deteriorating, based on SCS Range Site Guides. The proposed action could contribute to the increase of these species by causing a reduction in litter, and an increase in bare ground. This contribution would be minor compared to the role of natural processes which favor expansion of the increaser plants, and in itself would not cause a change in range condition. Changes in condition which would result from the natural expansion of broom snakeweed, creosotebush, and related shrubs and weeds are not considered as an impact of the proposed action, and are not included in Table 3-4.

SUMMARY

Prediction of impacts from the proposed action is based on relationships between vegetation and grazing management which are described in the literature, or which were observed during the 1979 field study. The most fundamental changes resulting from the proposed management program will be a more even distribution of livestock, and an increase in the number of cattle and wildlife AUMs. The literature and field observations agree that a more even distribution of animals will generally benefit the vegetation resource. On McGregor, such benefits would be especially apparent near existing water facilities, which would experience a reduced grazing pressure when new water facilities are in place.

The literature and field observations also agree that rangewide increases in AUMs are not necessarily detrimental to the vegetation resource, provided that the overall level of grazing utilization is moderate. This does not mean that AUMs can be increased without any changes to the vegetation. Some decrease in forage productivity, and especially litter production, could occur. However the vigor of the vegetation resources would be maintained or enhanced. Natural processes, which are generally having an adverse effect on the vegetation resource at present, would be little altered by the proposed action.

Although the areawide effects of the management program would not be substantial, there would be major changes in vegetation in areas where new water facilities are constructed. The main impact would result from concentrations of animals near the water facilities. Heavy grazing and trampling would be expected to cause many changes, including a reduction in canopy cover, a reduction in productivity, and a change in species composition to the point that condition would deteriorate by one class. These impacts are an unavoidable consequence of any program which proposes to change the distribution of livestock within the Co-use area, and which involves a more complete harvesting of the available forage resource.

The general analysis given above can be quantified for some impacts. Although the quantification is generally stated in terms of changes experienced over the entire 271,000 grazed acres, nearly all the measurable impacts would be experienced near new water facilities.

Quantified impacts include the following.

1. Development of improvements would cause the short-term loss of 118 acres of productive vegetation, of which 97 acres would be lost permanently.

2. Near new water facilities, grazing and trampling would cause the deterioration of range condition over an estimated 4,425 acres, leading to reduced herbage production, ground cover, and vigor, as well as a change in composition toward less palatable species. This acreage would decrease in condition by one class.

3. Over the 14 pastures as a whole, increased utilization would be reflected by a decrease in productivity between zero and ten percent. On the average, cover would not decrease by 0.5 percent.

4. The downward trend in condition which, due to natural causes, affects about 54,200 acres, would be expected to continue.

Stabilization of downward trends would occur on 4,400 acres near existing water facilities.

Qualitatively, reductions in litter would be associated with a reduction in fire, and less fire-related control of shrubs and weeds. Poisonous species would be expected to increase near water, especially in the Bolson, while endangered plants could decrease in areas where utilization increases. Vigor would improve in areas where utilization increases from light (or slight) to moderate.

PHYSICAL SETTING

No impacts on climate, topography or geology would occur.

AIR QUALITY

The proposed action would increase Total Suspended Particulates (TSP) because of increased wind erosion of lands where vegetation production has decreased. TSP would be expected to increase by about two percent in the Co-use area, an amount equal to the predicted change in wind erosion (see discussion on p. 3-22). This change would be too small to detect using conventional monitoring equipment (high-volume air samplers). Changes would be limited to the 14 pastures. No increase would occur in Areas A and B. Air quality standards for TSP would continue to be violated on the Range. The violations would

represent an economic, aesthetic, and nuisance problem, rather than a health hazard (Wilson, 1975).

The following additional impacts would occur. Reduced burning would decrease TSP from smoke. Emissions would occur from any new pumps which are not wind-powered. Increased traffic dust and exhaust would result from the traffic on newly developed roads. There would be temporary equipment emissions and dust associated with construction activities. Measurable changes from these effects would probably be limited to the temporary effects of construction.

NOISE

Equipment used for activities such as trenching, scraping, and filling would produce temporary, localized noise levels of 65-70 decibels (dBA), with peaks to 80 dBA measured at a distance of 50 feet from the equipment (EPA, 1977). The noise would disrupt sensitive wildlife species, such as antelope. Based on studies reported in DOA (1976), antelope reacted strongly (by running) when aircraft approached to within an altitude of 150 feet and a slant range of 500 feet. The calculated noise levels for the point of no reaction and the point of strong reaction were 70 and 85 dBA, respectively. No other impacts were identified and it was uncertain as to whether noise or object movement started the antelope running.

It is assumed that noise from the proposed construction and facilities would have an impact similar to that described above. Antelope would tend to avoid existing and future locations where machinery and vehicles are in operation. These areas include construction sites, existing and proposed engine-powered pumping facilities, and roads. Except in these relatively few locations, no long-term impacts would occur. An approximate measure of the affected area can be made by assuming that one acre of potential habitat is lost adjacent to each point source of noise and along each mile of road. Nearly 400 acres presently experience a noise impact due to traffic or pumping. An additional 210 acres would be impacted by noise from proposed construction, though only a small part of that acreage would be affected in any one year, and the impact would be temporary at each site. Permanent increases in intermittent noise levels would be experienced on 50 of the 210 acres, which would increase the area affected by noise by 25 percent.

SUMMARY

The proposed action would have minor effects on the physical setting of McGregor Range. TSP from wind erosion would increase by two percent, and emissions and dust would occur from construction, traffic, and fuel combustion. TSP from range fires would decline. Noise which would result from construction activity, pump operation, and traffic would disturb antelope and other wildlife in small localized areas. Of these impacts, only the temporary effects of construction would be likely to be measurable.

SOILS

EROSION

Wind erosion and sediment yield would increase if the proposed action is implemented, because the increased utilization of forage would be associated with a small reduction in the protective effects of vegetation. The effects of wind erosion are quantified in Appendix D (Table D-1) and the effects on water erosion (sediment yield) are quantified in Appendix D (Table D-2). Both sets of effects are summarized in Table 3-5.

The wind erosion equation uses productivity as a measure of the protective effects of vegetation. Using the worst-case estimates of a ten percent decrease in productivity, wind erosion would increase by seven percent for the Co-use area (Table 3-5). The increase would be limited to the Alluvial Fans, Mesa and Bolson natural units. The actual change would be less than seven percent. In many instances, a decrease in productivity is accompanied by a change in cover, and the use of a productivity value in the wind erosion equation produces no bias in the estimate of erosion. However, under the proposed action, the reduction in plant cover for the entire area is estimated to average only 0.5 percent (see p. 3-18). While reduced productivity would reduce soil protection because of reduced litter, 50 percent utilization of forage would leave considerable debris in place, helping to protect the soil. Prediction of a two percent increase in wind erosion is consistent with the change in cover, and contains an allowance for the additional effects of reduced litter. The increase would result in a wind erosion rate of 22.0 million tons per year, compared to 21.6 million tons per year at present.

Application of the sediment-yield prediction procedure (PSIAC, 1968) leads to a prediction that sediment yield would increase by 8 percent in the area affected by the proposed action (Table 3-5). The largest absolute increase in sediment yield is predicted to occur in the Alluvial Fans. This increase is based on the more intensive land use resulting from increased grazing. The increase is overstated in the sediment yield calculations due to the assumption that forage utilization would increase to 50 percent equally throughout the grazed area. However, as shown in Table 3-4, there would be more acres in light and slight grazing than in heavy grazing. A value of five percent would represent a more reasonable upper limit for the increase in sediment yield resulting from the proposed action. On this basis, the impact of the proposed action would be to increase sediment yield in the Co-use area from 303.9 acre-feet per year to 319.1 acre-feet per year.

Both the wind and water erosion estimates reflect the general magnitude of change and are not absolute values. The changes would be limited to the 14 pastures; no effects would be observed in Areas A and B. Within the pastures, the effects would be almost exclusively limited to areas adjacent to new water facilities.

TABLE 3-5. IMPACTS ON WIND EROSION AND SEDIMENT YIELD, BY NATURAL UNIT.

tay = tons per acre per year. ty = tons per year.
afsmy = acre-feet per square mile per year. afy = acre-feet per year.

	Mountain Foothills	Canyonlands	Mesa	Rimlands	Alluvial Fans	Bolson	Total
1. Acres in Unit, Co-use area	15,000	38,000	110,000	64,000	179,000	109,000	515,000
2. Acres affected by proposed action	15,000	38,000	110,000	2,000	61,000	45,000	271,000
3. Present wind erosion rate, tay	0	0	20	0	23	140	-
4. Total wind erosion at present, ty (1 x 3)	0	0	2,200,000	0	4,177,000	15,260,000	21,637,000
5. Predicted wind erosion rate on affected areas, tay	0	0	23	0	28	160	
6. Increase in wind erosion, ty ((5-3) x 2)	0	0	330,000	0	305,000	900,000	1,535,000
7. Total wind erosion, future, ty (4 + 6)	0	0	2,530,000	0	4,482,000	16,160,000	23,172,000
8. Net change, percent (4/7)	0	0	13	0	7	6	7
9. Present sediment yield, afsmy	0.47	0.32	0.37	0.35 a/	0.45	0.29	-
10. Total sediment yield at present, afy (1x9 divided by 640 acres)	11.0	19.0	63.6	35.0	125.9	49.4	303.9
11. Predicted sediment yield on affected acres, afsmy	0.53	0.38	0.42	0.41 b/	0.55	0.37	-
12. Increase in sediment yield, afy ((11-9)x2 divided by 640 acres)	1.4	3.6	8.6	0.2	9.5	5.6	28.9
13. Total sediment yield, future, afy (10 + 12)	12.4	22.6	72.2	35.2	135.4	55.0	332.8
14. Net change, percent (10/13)	11	18	12	0	6	9	8

a/. Average of range of 0.3-0.4.
b/. Change assumed proportional to change in Canyonlands.

Source: Allen and Anderson (1980).

COMPACTION

Based on comparisons to existing water facilities, the soil within an area of up to 10 acres around new water facilities would be compacted by cattle trampling. Added to this would be scarring and disturbance of normal soil profiles by construction. The total affected area would be up to about 800 acres. This would decrease infiltration capacity, especially on clay soils, such as Kerrick and Cale soils of the upland areas, Reyab soils on Mesa swales, and Tome soils in the low areas of the Bolson. Based on field experience, the EIS team estimates the decrease in infiltration capacity on these soils to be on the order of 50 percent. Lozier and Holloman soils would also be sensitive to compaction. Smaller changes (on the order of 15 to 30 percent) would occur on most other soils, but little change would be expected on gravelly soils. The severity of the impact is mitigated by the fact that grazing does not occur in the wet season.

The reduction in infiltration capacity would reduce soil moisture in the root zone, and where sizeable, could slightly reduce seed survival rates. These impacts would add to the tendency for the 800 acres on near-water areas to be eroded and to have a reduction in vegetation production and cover (see p. 3-17). Such erosion impacts are not specifically reflected in the estimates given in Table 3-5. Because the affected areas are small, the magnitude of additional erosion would be small.

In areas which are now lightly utilized, the effects of trampling would be expected to break up soil aggregates and increase infiltration capacity and soil moisture slightly (Savory, 1978). The reduction in litter described on p. 3-18 would tend to reduce soil organic content and moisture-holding capacity slightly, and allow greater fluctuations in soil microenvironment (Whitman, 1971; Brown and Schuster, 1969). Increased runoff (p. 3-25) would also favor a decrease in soil moisture. On acres directly affected by construction, earth-moving activity would be expected to alter or destroy existing soil structures. Impacts would be most significant where ripping equipment is used to penetrate caliche and fractured bedrock.

SUMMARY

The use of predictive equations indicates that wind erosion and sediment yield would increase by seven and eight percent respectively. Professional judgement indicates more realistic increases would be two and five percent respectively. Soil structure would be destroyed at construction sites, and trampling would cause compaction and related physical changes on about 800 acres near new water facilities. Soil moisture and infiltration capacity would be reduced and erosion would increase near the new facilities.

WATER

SURFACE WATER

Quantity. The prediction of existing flood flows (Table 2-7) was based on methods described in Appendix E. The method uses a factor, called the runoff curve number (or CN), whose value depends on the type of plant cover and its density. Changes of cover which do not change the CN will produce no quantifiable effect on the amount of flood runoff calculated by the methodology. In the Alluvial Fans and Bolson natural units, cover density would have to change by 13 percent in order for the CN to change by one number. For the other natural units, a change in cover of five percent would be needed to change the CN by one number.

As discussed on p. 3-18, the proposed action would produce an areawide change in cover which is estimated to be 0.5 percent or less. This change is too small to affect the CN in any natural unit, and too small to produce a change in runoff which could be quantified using the referenced methodology. Substantial decreases in cover would occur near new water facilities (slightly offset by increases near existing water). On the areas near new water, the change in cover would be sufficient to cause an increase in runoff. However, the acreage affected by each facility would be small (generally 25 acres, or 100 acres in upland areas). Within any sizeable drainage basin (several hundred acres or larger), the effects of a change in cover in one small part of the watershed would not lead to measurable changes in the total runoff from the basin.

Since almost all runoff in the area occurs as flood flows, total runoff from small areas experiencing reduced cover would increase. The increase in runoff would be complemented by a reduction in the water which is retained where it falls. Therefore soil moisture and the amount of water available to plants can be expected to decrease. The decrease in water available for plants would be too small to measure. Most of the runoff would continue to seep into arroyo bottoms, where it would provide ground water recharge. The changes would be comparable to those reported in the technical literature (for example Hanson et al., 1970; Martin and Rich, 1948).

Quality. For the areas near new water facilities, the increased soil erosion (p. 3-22) would cause the increased runoff water to carry more sediment and to be more turbid than at present. Water salinity would likely increase with sediment content. However, as described above the magnitude of the change would be small, except near the directly affected area. Thus, except for any reservoirs (tanks) located so as to receive runoff directly from an improved area, no sediment-related water quality changes would occur in surface waters. Increased numbers of livestock would lead to slightly increased frequency of total and fecal coliform contamination (Stephenson and Street, 1978). Most of the new water facilities would be troughs which are protected from runoff, so these changes in coliform levels would be observed primarily in existing tanks.

GROUND WATER

The proposed action would have no impact on the availability or quality of ground water. As discussed in Chapter 2 (p. 2-24), ground water supplies are variable. It is difficult to predict where reliable quantities of good-quality ground water can be found. Therefore, it is possible that some of the proposed wells could not be successfully completed, in which case the funds expended on the wells would be lost.

WATER SUPPLY

The increase in cattle, deer, and antelope AUMs would cause water use to increase from 50 to 63 acre-feet per year. The amount of surface area in troughs and water storage facilties would approximately double from 6 to 12 surface acres, increasing evaporation losses from 36 to about 72 acre-feet per year. The increased water demand would be met from the existing pipelines and proposed new wells. These impacts are small when compared to the total water resources of the Range. Moreover, the impacts have no adverse effects since most of the water which is not used on the Range is lost to evaporation or seeps into ground water where it eventually becomes too saline for beneficial use.

SUMMARY

The proposed action would have no quantifiable effect on flood runoff. Except for a minimal increase in coliform counts in surface water, water quality would also be unaffected. There is some risk that funds would be expended on wells that could not provide water; thus no return might be obtained for such expenditures. An increase in water use from 86 to 135 acre-feet per year would occur due to increased consumption by cattle and wildlife, and increased evaporation from storage tanks and troughs. This water would not otherwise be available to be put to beneficial use.

WILDLIFE

The prediction of impacts on wildlife is based on two findings presented in the vegetation section of this chapter. First, the calculation procedures used in Table 3-3 determined that the proposed objectives for increasing cattle AUMs could be accomplished without use of forage needed by wildlife. The Table indicates that adequate vegetation is available on McGregor Range to sustain increases in the population of deer, antelope, and cattle, without exceeding 50 percent utilization of key species. The second finding is that near new water facilities, plant cover would be reduced as described on p. 3-18. This change would affect approximately 4,425 acres of land, and would represent the only significant change in wildlife habitat resulting from the proposed action.

GAME ANIMALS

Deer. NMDGF has developed estimates of optimal deer populations. It is assumed that by providing additional water facilities, and more closely monitoring the wildlife populations, the proposed action would cause the optimal populations to be reached. It should be noted that the dynamics of the deer population are not well understood. Factors other than food and water could limit the size of the herd, and could prevent the optimum densities from being reached. Nonetheless, use of the optimum numbers is desirable as a basis for determining wildlife forage needs, since the resulting estimates represent an upper limit of the potential food requirements. The optimum densities estimated by NMDGF are:

Mountain Foothills:	45	deer per sq. mile
Canyonlands:	40	deer per sq. mile
Mesa:	3	deer per sq. mile
Rimlands:	10	deer per sq. mile
Alluvial Fans:	9	deer per sq. mile
Bolson:	3	deer per sq. mile

In Table 3-6 these densities are translated into population levels, by pastures. The population levels in Table 3-6 were used to calculate deer AUMs, assuming a ratio of 17 deer to 1 cow. The results are given in Column 9 of Table 3-3, by pasture. Average deer population would increase from 3,730 to 5,096, an increase of 1,366 animals. Note that the values given in Table 3-3 do not include increases in deer populations in Areas A and B; however such increases are included in Table 3-6.

TABLE 3-6. PROJECTED DEER AND ANTELOPE POPULATIONS, BY PASTURE

PASTURE NUMBER	DEER EXISTING	DEER FUTURE	DEER INCREASE	ANTELOPE EXISTING	ANTELOPE FUTURE	ANTELOPE INCREASE
1.	26	146	120	-	-	-
2.	20	118	98	-	-	-
3.	1391	1531	140	-	-	-
4.	751	914	163	-	-	-
5.	1050	1265	215	-	-	-
7.	67	147	80	-	-	-
8.	320	426	106	2	6	4
9.	26	146	120	72	195	123
10.	10	57	47	22	57	35
11.	14	85	71	36	101	65
12.	7	38	31	19	51	32
13.	28	105	77	44	120	76
14.	10	57	47	28	76	48
15.	10	61	51	30	82	52
TOTAL	3730	5096	1366	253	688	435
AREA A	204	985	781	-	-	-
AREA B	221	838	617	-	-	-
GRAND TOTAL	4155	6919	2764	253	688	435

Source: Unpublished data, BLM and New Mexico Department of Game and Fish.

Although forage would be available to support increases in both deer and cattle numbers, some competition for forage would occur, especially in winter when cattle may browse mountain mahogany. However, the competition would benefit deer. Forage utilization by cattle would cause regrowth, increasing the palatability of the vegetation, and effectively increasing the amount of food which deer would preferentially consume. The addition of improvements in the Canyonlands and Mountain Foothills would increase the amount of land suitable for livestock grazing. However, no adverse changes on vegetation or other environmental characteristics are predicted for this land. Therefore its value as deer habitat would not be affected. Near new water facilities, significant changes in cover would occur, and cattle numbers would be increased for prolonged periods. Deer tend to avoid areas where cattle numbers are high (Dusek, 1975). Consequently, areas near new water might no longer be considered as primary deer habitat.

Antelope. A procedure similar to that described for deer was used to calculate antelope populations and AUMs. As the existing antelope population is apparently limited by an unknown factor, it is not certain that the optimum population would be achieved. However, as for deer, it is appropriate to manage grazing on the basis that food for the optimum population must remain available for the ultimate antelope herd, and not utilized by cattle. NMDGF estimates optimal antelope densities at 4 per square mile in the Mesa natural unit. Table 3-6 lists the projected antelope populations, by pasture. AUM equivalents (assuming 19 antelope equal one cow) are given in Table 3-3. The herd size is projected to increase from 253 to 688 animals.

The construction of new water systems would help meet water requirements for antelope. As discussed on p. 3-3, species of special importance to the antelope diet, such as forbs, do not appear to be adversely affected by present levels of grazing. Data are not available to predict the extent to which these species would be affected by the projected increase in cattle grazing. However, as the proposed level of grazing would be moderate overall, there would be minimal adverse effects to these species. As discussed on p. 3-21, antelope are sensitive to noise. They may be disturbed by construction activities, but this effect would be temporary.

Game birds. Game birds are sensitive to decreases in cover and increases in trampling (Schemnitz, 1961). In the 4,425 acres near new water facilities, habitat changes and increased trampling would reduce the effective habitat available to these species, and would cause a decrease in their abundance. However, data are not available to quantify this impact. Reductions would be offset to some extent because of the increased availability of water. Dove and Gambel's quail populations would increase with more watering holes, while scaled quail would probably not be affected (Campbell, 1960). Overall, the anticipated change would be expected to be small, as substantial unaltered habitat would remain throughout the Range.

SMALL MAMMALS

In the preparation of Table 3-3, the EIS team determined that sufficient forage is available to support existing populations of small mammals (such as rodents, rabbits), and increased numbers of deer, antelope and cattle, without exceeding 50 percent utilization of forage. Therefore, the proposed action would be expected to maintain the existing populations, except for changes which would occur near new water facilities. In such areas, species which are dependent not only on cover conditions, but on the food from flowering and seeding of grasses and forbs, would experience locally significant impacts. Increased cattle use would reduce populations and biomass of herbivorous rodents on heavily grazed areas near new water. These effects would be especially evident in spring, when competition for food between rodents, rabbits, and cattle for food is generally most significant. (Fitch, 1947; Smartt, 1979). Most affected by the change in cover would be the cotton rat and the silky pocket mouse. One species, the Mexican vole, has an extremely limited range within the northernmost limit of the Co-use area. Changes in grazing intensity, climate or other factors could cause the vole to retreat onto Lincoln National Forest, where it is more abundant at present.

The new water would also enhance the habitat for some types of wildlife, by creating a more diverse environment, and by causing some changes in the species composition of the plant cover (reflected by the deterioration in range condition in these areas). The total number of mammal species near the facilities would increase for the Range as a whole (Wood, 1969). Jackrabbit populations would be expected to increase, while desert cottontail would decline (Smith, 1940). It is not possible to quantify these impacts, but they would be small due to the limited acreage involved. The addition of water itself would not be expected to have benefits, as distribution of these mammals is generally not related to water supplies.

It should be noted that the relationship between grazing, vegetation, and wildlife near the new water facilities would be a complex one. Based on studies elsewhere, small mammals help stabilize the plant community and promote productivity by increasing the rate of nutrient recycling, and by reducing litter (Grant, 1974). Rodents generally increase evenness of vegetation (Harper, 1969; Fitch and Bently, 1949) and promote diversity by "planting" seeds through caching (Griffin, 1971; West, 1968). Caching also increases reserve supplies of seed following fires. Distribution of rabbit pellets also promotes reseeding (Brown, 1947). Changes in wildlife populations, initially in response to increased cattle numbers, could reduce the above benefits to the vegetation, furthering the tendency towards deterioration in range condition (Gulley, 1973). It is not possible to quantify the anticipated reduction in benefits to vegetation.

OTHER ANIMALS

Construction activities would permanently destroy small areas of habitat (97 acres). Temporary displacement of most species would occur near sites of active construction. New fences (such as at corrals) would provide perch sites

for birds and lizards. Perches at new water facilities would have the same benefit.

Some non-game birds, especially ground-nesting species, would be affected in a manner similar to game birds. Populations might decline slightly near water. However, because of plant composition changes near the new water, other species would benefit, and overall bird diversity in these areas would increase (Wiens and Dyer, 1975). Seasonal use of the area by waterfowl may increase slightly. Most bird species would benefit from the additional availability of water.

The vegetation changes would have minimal effects on most reptiles so long as no grazing occurs in the summer months. However, some adverse impacts would occur near the new water facilities. For example, the horned lizards and Mojave rattlesnake on Otero Mesa could be affected by increased trampling, especially during late spring. It is not possible to quantify these impacts with existing data.

Access routes associated with new water facilities would open areas to human disturbance, poaching, and habitat destruction. The two large colonies of fringed myotis would continue to be especially vulnerable to vandalism and pos- sible complete destruction during the pupping season.

THREATENED OR ENDANGERED SPECIES

As described on p. 1-10, BLM has consulted with FWS regarding threatened or endangered species. As required by the Endangered Species Act, BLM will prepare a biological assessment of the effects of the proposed action on the endangered peregrine falcon. This species may be affected by the minor habitat changes which would result from the proposed action.

Any of the regionally threatened or endangered species on the Range could be affected by changes in the plant cover, increased cattle trampling and, in the case of prairie dogs, increased competition for food. However, as noted above, the proposed action generally has minimal effects on wildlife. Effects on threatened or endangered species would be limited to a reduction in potential habitat caused by changes in range condition near new water facilities. None of these changes would occur in areas identified as critical habitat for a threatened or endangered animal.

BIOMASS AND FOOD SUPPLY

In order to determine the impact of the proposed action on wildlife, the study team estimated the forage requirements of existing and optimum populations (Table 2-10). The discussions above have illustrated how this information was used to reach the conclusion that the projected increase in livestock grazing is compatible with both an increase in deer and antelope populations, and maintenance of the existing populations of other grazing animals, primarily rodents and rabbits. The lack of impact reflects the present light grazing in the Co-use area, and the fact that the proposed level of forage utilization

will be moderate. A number of assumptions were made in the estimate of wildlife forage needs. These assumptions are not critical to the prediction that the proposed action would not impact wildlife food supplies, since the proposed monitoring program would be able to ensure that wildlife populations are not adversely affected by excess cattle grazing. If the assumptions prove to underestimate the amount of food needed by wildlife, then the result would be a reduction in the amount of livestock AUMs which are estimated in Table 3-3. The assumptions are as follows.

1. There is a direct relationship between biomass and food assimilation. Although this assumption oversimplifies actual biomass-assimilation relationships, it provides an estimate of wildlife demand for forage which is of the correct magnitude.

2. Deer and antelope biomass are based on NMDGF estimates of population densities. All other biomass data are derived from field studies performed in the summer of 1979.

3. Deer and rabbit diet is divided equally between browsing and grazing. About 60 percent of the grazing is related to forbs, and 40 percent is related to grasses.

4. The competition for forage between deer and cattle is 44 percent; between antelope and cattle it is 50 percent. The assumption provides a worst-case basis for reserving forage for deer and antelope, since the actual competition is probably less than 25 percent.

5. Biomass estimates are yearly averages, and take into account seasonal fluctuations.

SUMMARY

The proposed action would generally protect or enhance the environmental conditions which presently support a diverse wildlife population on McGregor Range. Forage sufficient for wildlife needs would remain available even though livestock grazing would increase. Major changes to wildlife habitat would be limited to areas near proposed improvements, especially water facilities, where changes in the vegetation would benefit some species and have adverse effects on others.

Increased availability of water and more intensive management would allow deer and antelope populations to increase. More intense cattle grazing would not impair the habitat of either of these large herbivores. Optimal populations of 5,096 deer (3,597 AUMs) and 688 antelope (435 AUMs) would be reached, although factors other than food and water could play a role in limiting growth of the herds. Populations of other wildlife species would generally be maintained.

Introduction of water facilities would benefit species which can utilize the water or associated perch sites, or which are favored by decreases in cover

and a greater diversity in vegetation. Animal species likely to be favored by new water facilities would include jackrabbits and waterfowl. The change in cover and vegetation would adversely impact other species, including scaled quail, cottontails, ground-nesting birds, horned lizards and the Mohave rattlesnake. Game birds such as Gambel's quail and mourning dove would be little changed by the new water.

The proposed action would have little impact on overall populations of deer, antelope, small mammals, and rabbits. This is because the EIS study team estimated biomass of these animals and determined that there was adequate forage for their needs. The distribution of some species would shift with fewer numbers of rodents, cottontails, and birds near new water facilities and increased numbers of jackrabbits in heavily grazed areas. Increased access to the Range could endanger colonies of fringed myotis.

CULTURAL RESOURCES

Increases in livestock numbers on the Range would lead to deterioration of cultural resources, primarily those which are at or above ground level. Such impacts would be most likely around proposed new water facilities and in proposed corrals. Trampling of exposed or subsurface cultural resources causes breakage and edge damage to lithic remains, while large, potentially identifiable ceramic sherds are broken into pieces too small to be analyzed. The loss of ceramic material would be potentially critical on some sites in the project area since little pottery is available on which to assign phase designations. Trampling would also adversely impact structures such as sites which have a floor and faint traces of adobe walls. These sites, which are usually covered by wind-blown sand, tend to retain water longer than the surrounding areas. Cattle walking over the sites after rains cause damage to the floors and to the traces of walls. The trampling impacts would be especially significant in Pastures 1 and 3, which have a relatively high density of known habitation sites. Trampling also affects the stratigraphic integrity of sites, making study of cultural continuity a problem. A site-specific Environmental Assessment would be prepared by BLM prior to construction or placing salt blocks (Table 1-1). Thus impacts of increased trampling around such sites would be minimized by locating the salt away from sensitive areas.

Some increased damage to historic structures could occur due to cattle rubbing. However, such structures are few and generally distant from areas where increased cattle numbers are expected to occur. Therefore, this impact is expected to be small. Increased access to the Range associated with new roads could lead to vandalism of cultural resources. Increased rates of wind and water erosion would damage all types of cultural resources within the Co-use area (see Table 2-13). The rate of increase of erosion would be small, and concentrated near facilities which in turn would be located away from sensitive areas. Therefore the changes in site condition would probably not be noticeable.

Construction activities would directly destroy or disturb any resources in the area being cleared or bladed. Mitigation measures (see Table 1-1) would minimize this impact because sensitive areas would be identified prior to construction and facilities would be relocated to avoid damage.

Summary. Potential impacts to cultural resources would be most likely to occur due to trampling near new water facilities. These impacts would be minimized by environmental assessment procedures designed to avoid the construction of facilities in areas where cultural resources are abundant and/or sensitive. Any increases in trampling would cause the loss of cultural resources which occur at or above the ground surface, such as lithic and ceramic remains and wall traces. Rubbing of historic sites could occur locally. Improved access along new roads could lead to vandalism. Increases in erosion would lead to site deterioration. All these impacts would result in a reduction of information available for the study of past civilizations.

VISUAL RESOURCES

The soil exposure and vegetative disturbance associated with construction sites would create 97 acres of land contrasting with the natural setting of the surrounding landscape. The facilities themselves would also be a source of contrast. The changes would impact 0.02 percent of the Co-use area. The most noticeable effects would be associated with roads, which would represent new lines of color and texture through the landscape. Similar changes from past construction are greater in magnitude, yet remain a subordinate element of the landscape. Consequently, the projected contrasts would be expected to be minor. Design features (Table 1-1) would be expected to minimize the impacts which do occur. The changes would not be in conflict with the Visual Resource Management (VRM) classification of the Co-use area. After implementation of the proposed action, 450 square miles would remain in VRM Class III and 354.7 square miles would remain in VRM Class IV.

WILDERNESS

Section 603(c) of FLPMA does not allow any new activity on public lands which would impair their wilderness suitability. The procedures for protecting the three areas identified for intensive inventory are discussed in Chapter 2 (p 2-40). Application of the BLM guidelines would prevent any adverse impacts on wilderness from the proposed action. Construction of facilities associated with the three inventory units would be delayed pending clearance through the application of wilderness criteria. The delays would potentially affect the following improvements and associated AUMs.

Pasture 1: 1 well, 1 storage tank with trough; 600 AUMs.
Pasture 3: 2 wells, 3 storage tanks, 6 troughs, 2 dirt tanks; 1000 AUMs.
Pasture 5: 1 well, 1 storage tank, 2 troughs; 300 AUMs.

If any of the areas are designated as suitable for wilderness, grazing would continue on these parcels, since grazing uses existed prior to the adoption of the Federal Land Policy and Management Act on October 2, 1976. However, the facilities listed above would most likely not be constructed and the AUMs resulting from the proposed action would be reduced by the amount listed above.

RECREATION

Since the proposed action would not result in any significant change in game bird populations, hunting potentials for game birds would remain unchanged. Big-game hunting opportunities are assumed to increase in direct proportion to increases in deer and antelope populations. The following increases in hunting licenses and hunter days would occur:

1. Hunter visitor days would increase from 1,425 to 1,995.

2. Hunting licenses for deer would increase from 800 to 1,036 per year.

3. Hunting licenses for antelope would increase from 25 to 68 per year.

To the degree that cultural resources are disturbed or destroyed, the potential for the eventual development of recreation-related cultural and natural history resource sites would be adversely affected. In the context of the existing and potential recreational use of the Range, these impacts would be minor.

Overall, the proposed action would have little impact on recreational opportunities on the McGregor Range. However, if optimum deer and antelope populations are reached, there would be an increase in the amount of hunting activity each year.

LAND USE

The proposed action involves no basic change in the amount of land which would be used for different purposes. However the action would increase the extent to which 271,000 acres of the Co-use area are used to support wildlife and livestock grazing. Except for the acreage around new water facilities, wildlife use of the acreage would not be affected. The improved management program would require more intensive involvement by operators. Specifically, operators would be required to place salt and protein supplement at least 0.5 miles from water facilities, which would increase labor requirements. The proposed action involves no components which would conflict with continued use of McGregor Range for military purposes.

LIVESTOCK GRAZING

Lessees would continue to be large operators, since the grazing parcels would be relatively large and leases awarded to high bidders. Most lessees would purchase cattle prior to the grazing season and send or sell them to feed

lots when the season is over. There would continue to be a few local operators who lease parcels near or adjacent to their lands. Most lessees would be from elsewhere in New Mexico or from adjoining states. Increased grazing would lead to less litter, and there would likely be fewer acres of land lost to fires resulting from missile crashes and other defense ordnance.

Suitability. In the Canyonlands and Mountain Foothills natural units, improvements would be placed in areas which are presently rated as potentially suitable for grazing. For typical slope conditions in the units, the criteria indicate that areas which are within 0.6 miles of water would be suitable for grazing. If the proposed action is implemented, 50 percent of the area in these units would be within 0.6 miles of water (compared to 25 percent at present). The proposed action would thus double the acreage of suitable lands in the upland areas. Approximately 13,250 acres would change from potentially suitable to suitable. For the grazed area (271,000 acres), this would increase the total acreage rated as suitable from 229,650 to 242,900.

In the Mesa, Alluvial Fan and Bolson natural units, standard criteria indicate that almost all areas are classified as suitable. Therefore the proposed action would cause no change in the suitability rating. However, in practice, current grazing is concentrated within 2 miles of water in these units, and there are large areas of slight utilization at greater distances from water. The proposed action would provide reliable water within 2 miles of nearly all parts of all pastures. This would result in an increase in grazing on areas which are now lightly grazed because of distance to water. The extent of the increase is discussed in the vegetation section of this chapter.

OTHER USES

Research on black grama grass lands described on p. 2-45 would continue. Management activity would be expected to enhance wildlife land uses, especially through the expansion of the deer and antelope herds. Recreation impacts of the proposed action are described on p. 3-33.

TRANSPORTATION

The proposed action would involve 46.75 miles of new access roads or trails, which would increase access to sectors of the 14 pastures which are presently difficult to reach using conventional vehicles. The increase represents an addition of 15 percent to the existing road network. Additional cattle trucks and road construction equipment would increase traffic by a few vehicles for a few days of the year. This increase would have a negligible effect on the daily vehicle counts listed in Chapter 2.

SOCIO-ECONOMIC CONDITIONS

The proposed action would increase the income which BLM obtains from grazing fees. The expected increase would be from $233,000 per year to $315,000

per year, or about $82,000 per year, assuming an average bid of $5.50 per AUM. The increase would occur gradually over a 12-year period. The increase represents about 0.13 percent of the total personal income of Otero County. Benefits to lessees would increase from $994,800 per year to $1,493,700 per year, a gain of $498,900 or 50 percent. The increased benefits would result from increases in AUMs, calf weight, and calf crops. The total benefits from the grazing program would represent 0.3 percent of the total value of New Mexico's beef industry and 14 percent of the industry value in Otero County. However, most of the income would continue to be received outside Otero County and earned outside New Mexico.

The proposed action would have no significant effect on the small amount of energy which is utilized as part of the existing grazing management program.

CHAPTER 4

MITIGATING MEASURES
NOT INCLUDED IN PROPOSED ACTION

CHAPTER 4. MITIGATING MEASURES NOT INCLUDED IN PROPOSED ACTION

All proposed mitigation is described in Chapter 1 as part of the design features of the proposed action (Table 1-1).

CHAPTER 5

UNAVOIDABLE ADVERSE IMPACTS

CHAPTER 5. UNAVOIDABLE ADVERSE IMPACTS

The most significant impacts listed in Chapter 3, which are adverse and which cannot be mitigated, are summarized in this chapter.

VEGETATION

The proposed action is expected to maintain the basic good to fair range condition on McGregor Range. The only substantial adverse impacts could occur near new water facilities, where range condition would begin to deteriorate once cattle begin heavy grazing and trampling in these areas. A downward change of one condition class is projected to occur on 4,425 acres within the existing fourteen pastures.

Under a worst-case analysis, increased utilization of forage would cause a reduction in herbage yields of up to ten percent rangewide, from 560 to 502 pounds per acre per year. The effects would be greatest in those areas which presently experience light or slight utilization, and which would be near a new water supply. In the near-water areas, canopy cover would decrease, basal cover would increase (due to sod formation of presently clumped grasses), and total plant cover would decrease as much as 50 percent. The rangewide impact of this localized change would be a 0.5 percent reduction in cover. Construction of improvements would cause disturbance or removal of vegetation on 118 acres, of which 97 acres would be affected over the long term. The remainder (pipeline routes) would experience short-term impacts.

PHYSICAL SETTING

Effects of the proposed action on the physical setting of McGregor Range would generally be too small to measure. Total suspended particulates (TSP) would increase by an estimated two percent due to increased wind erosion. Construction would cause localized temporary emissions of air pollutants and an increase in noise levels to 65 to 70 decibels (with peaks to 80 decibels). The noise would adversely affect as much as 210 acres of wildlife habitat.

SOILS

Wind erosion would increase by about two percent as a result of the reduction in soil protection caused by reduction in litter and cover. Sediment yield would increase by about five percent. Construction of improvements would disrupt soil structure on 118 acres. Cattle trampling would increase soil compaction on a total of 800 acres. These acres occur as small, isolated areas near each new and existing improvement. Compaction would result in decreased infiltration capacity.

WATER

Water consumption by cattle and wildlife would increase from 50 to 63 acre-feet per year. Evaporation from stock and wildlife water supplies would in-

crease 36 to 72 acre-feet per year. Because of uncertainty about ground water supplies, some investments in wells could be lost.

WILDLIFE

The proposed action has no substantial adverse effects on the overall wildlife resources on McGregor Range. Near new water sources, increased use of forage by cattle and resulting decreases in forage production and canopy cover, would reduce populations and biomass of herbivorous rodents, cottontail rabbits, and some birds and predator species. In these areas, horned lizards and the Mojave rattlesnake could be adversely affected by increased trampling. Temporary displacement of deer, antelope, game birds, and small vertebrates would occur near active construction sites. Construction would permanently destroy 97 acres of wildlife habitat.

CULTURAL

Mitigation measures would minimize the effect of the proposed action on cultural resources. However, resources could be affected by increased trampling and rubbing by cattle, especially in areas near new water facilities.

OTHER RESOURCES

No adverse impacts have been identified which would substantially alter visual resources, wilderness, recreation, land use, transportation, or socioeconomic conditions.

CHAPTER 6

THE RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

CHAPTER 6. THE RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed action involves a tradeoff between: 1) increased benefits from the harvest of vegetation by cattle, deer and antelope, accompanied by stabilized range condition in presently overgrazed areas; and 2) decreased production of vegetation, associated with substantial adverse environmental changes near new water facilities. The tradeoff would bring forage production and utilization into a balance, unlike the existing situation where productivity is high, but utilization is light. The balanced production and harvest would provide a sustained yield of vegetation at a level which would support 36 percent more herbivore grazing than now occurs.

All significant benefits and impacts from the proposed action relate to the long-term use of the Range over a 20-year period or beyond. Benefits from the project include: conversion of 13,250 acres from potentially suitable to suitable for grazing; a more even distribution of livestock within the existing pastures; stabilization of downward trends in condition near existing water supplies; an increase in forage utilization; an increase in plant vigor in areas now subject to light or slight utilization; forage allowance and provision of water for large game animals (deer, antelope); an increase in livestock numbers and AUMs; and an increase in income within the private cattle industry of about $498,900 per year.

The improved distribution of animals and the increase in forage harvest would cause the following losses in productivity: 97 acres of grazing land and wildlife habitat would be permanently lost; range condition would decrease by one class on about 4,425 acres; forage production would decrease by no more than ten percent; plant cover would decrease by 0.5 percent; wind erosion would increase by two percent; sediment yield would increase by five percent; about 800 acres of soil would experience an increase in compaction and an associated decrease in moisture, organic content and potential for seed germination.

CHAPTER 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

CHAPTER 7. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This chapter identifies resource commitments associated with the proposed action which are irreversible (incapable of being reversed) and irretrievable (once used, cannot be replaced). Many additional resource commitments exist which are irretrievable as long as the proposed grazing program is in effect, but which would be reversible if the program were changed; examples include the decrease in forage production and plant cover.

1. Construction of improvements would result in the permanent elimination of 97 acres of vegetation and wildlife habitat, and a permanent change in the soil structure on 118 acres.

2. Erosion would cause the irretrievable loss of soil for the duration of the proposed action. Wind erosion would increase from 21.6 million tons per year to 22 million tons per year (two percent increase) and sediment yield would increase from 303.9 acre-feet per year to 319.1 acre-feet per year (five percent increase).

3. Water use would increase by 49 acre-feet per year, compared to existing levels.

4. Cultural resources affected by trampling, rubbing or erosion would suffer an irreversible deterioration in condition. Once disturbed, resources are more difficult to recover and interpret properly, causing a data gap. Excavation of resources at construction or salting sites would recover information which is available to current techniques, but would foreclose the opportunity to gather additional information which might be recovered by future improvements in technique.

5. Investments of construction funds and materials for range improvements would represent a permanent commitment of these resources.

CHAPTER 8

ALTERNATIVES TO THE PROPOSED ACTION

CHAPTER 8. ALTERNATIVES TO THE PROPOSED ACTION

INTRODUCTION

This chapter evaluates six alternative approaches to the management of the Co-use area. The Bureau of Land Management (BLM) could implement any of these alternatives in place of the proposed action, or could incorporate portions of the alternatives into the action which is selected for implementation. Two alternatives would be available in place of the proposed action:

Alternative A. No action (continue existing program); and
Alternative B. Discontinue livestock grazing.

Four alternatives would implement the proposed action, but with modifications:

Alternative C. Add grazing in Area A;
Alternative D. Change grazing season to October-March;
Alternative E. Change season to October-March, and reduce grazing;
Alternative F. Reduce grazing in Pastures 3, 4, and 5, and provide for summer grazing.

Table 8-1 lists the elements of the alternatives in a form which permits comparison to the proposed action. Table 8-2 compares the proposed action and the six alternatives in terms of quantifiable impacts on each environmental resource. Figure 8-1 illustrates the utilization of forage which would occur from each alternative and can be compared to Figure 1-3, which illustrates forage use under the proposed action.

The basic assumptions and guidelines used in this Chapter are similar to those outlined for the proposed action on page 3-1. For example, the prediction of impacts is based on interpretation of existing relationships between grazing management and the environment of McGregor Range, and on relationships which are described in the literature. While impacts are quantified when possible, the numbers given are an indication of approximate, not absolute, amounts of change. The predictions of impacts represent the best estimates that can be made given present limitations in site-specific data and scientific knowledge.

A number of additional assumptions and guidelines apply specifically to this Chapter. Most important, there are many similarities in impacts between the proposed action and one or more of the alternatives. For example, the construction of improvements, which would occur under all alternatives except B, would have impacts similar in nature to those predicted for the proposed action. Such impacts include disturbance of soil and vegetation at construction sites, and the production of temporary dust, fumes, and noise during construction. The alternatives differ primarily in the magnitude and location of the impacts. Similarly, most alternatives would involve the development of new water facilities. Such new facilities would lead to similar basic changes in productivity, cover, soil properties, and erosion, regardless of the alternative being considered. Again, differences in the amount and area of the impacts would occur.

TABLE 8-1. KEY ELEMENTS OF THE PROPOSED ACTION AND ALTERNATIVES.

Affected Environment	PROPOSED ACTION Expand grazing in existing pastures	ALTERNATIVE A No action (continue existing program)	ALTERNATIVE B Discontinue grazing	ALTERNATIVE C Add grazing in Area A	ALTERNATIVE D Change grazing season to October-March	ALTERNATIVE E Change grazing season to to October-March and reduce grazing	ALTERNATIVE F Reduce grazing in Pastures 3, 4, 5 and provide for summer grazing
1. Grazed acreage	271,000	271,000	none	355,000	271,000	271,000	225,000
2. Ungrazed acreage	244,000	244,000	515,000	160,000	244,000	244,000	290,000
3. Number of pastures	14	14	0	17	14	14	12
4. Average number cattle per year	6,359	4,700	0	7,659	9,538	6,359	5,482
5. Average cattle AUMs per year	57,230	42,300	0	68,933	57,230	38,153	49,335
6. Grazing season	October 1 to June 30	October 1 to June 30	none	October 1 to June 30	October 1 to March 31	October 1 to March 31	flexible
7. Annual income to BLM a/	314,765	232,650	none	$ 379,132	$ 314,765	$ 209,842	$ 271,343
8. Annual benefits to Industry	$ 1,493,700	$ 994,800	none	$ 1,799,100	$ 1,493,700	$ 995,800	$ 1,287,700
9. Deer population b/	5,096	3,730	2,548	5,096	5,096	5,096	5,096
10. Deer AUMs per year	3,597	2,633	1,799	3,597	3,597	3,597	3,597
11. Antelope population	689	253	253	689	689	689	689
12. Antelope AUMs per year	435	160	160	435	435	435	435
13. Construction activity none	Replace 17.5 miles pipeline Build 38.5 miles pipeline " 19 wells " 77 water troughs " 39 water storages " 5 dirt tanks " 3 corrals " 46.75 miles of road	Replace 17.5 miles pipeline		Replace 17.5 miles pipeline Build 38.5 miles pipeline Build 35 wells " 94 water troughs " 55 water storages " 5 dirt tanks " 4 corrals " 57.5 miles road " 40 miles fence	Replace 17.5 miles pipeline Build 38.5 miles pipeline " 19 wells " 77 water troughs " 39 water storages " 5 dirt tanks " 3 corrals " 46.75 miles of road	Replace 17.5 miles pipeline Build 38.5 miles pipeline " 19 wells " 77 water troughs " 39 water storages " 5 dirt tanks " 3 corrals " 46.75 miles of road	Replace 17.5 miles pipeline Build 28.5 miles pipeline " 13 wells " 54 water troughs " 28 water storages " 4 dirt tanks " 2 corrals " 34.75 miles of road
14. Acres of construction impact	118	7	none	183	118	118	99
15. Cost of construction a/	$ 1,388,673	$ 498,960	none	$ 2,621,873	$ 1,388,673	$ 1,388,673	$ 984,294
16. Annual operating costs a/	$ 135,000	$ 115,000	none	$ 135,000	$ 135,000	$ 135,000	$ 135,000
17. Changes to black grama exclosures	none	none	none	none	none	none	none
18. Changes to cooperative agreements	none	none	discontinued	none	none	none	none
19. Range conservationist	hired	not hired	not hired	hired	hired	hired	hired
20. Monitoring performed	yes	limited	no	yes	yes	yes	yes
21. Maintenance performed by BLM	yes	yes	no (Army responsible)	yes	yes	yes	yes

a. Income is used for BLM construction and operations on McGregor.
b. Values reflect conditions in existing 14 pastures.

Source: Bureau of Land Management, Las Cruces District.

TABLE 8-2. SIGNIFICANT LONG-TERM IMPACTS OF THE PROPOSED ACTION AND THE SIX ALTERNATIVES.

RESOURCE	PROPOSED ACTION Expand grazing in existing pastures	ALTERNATIVE A No action (continue existing program)	ALTERNATIVE B Discontinue grazing	ALTERNATIVE C Add grazing in Area A	ALTERNATIVE D Change grazing season to Oct.-March	ALTERNATIVE E Change grazing season to Oct.-March and reduce grazing	ALTERNATIVE F Reduce grazing in Pastures 3, 4, 5 and provide for summer grazing
ACRES OF VEGETATION AND HABITAT ELIMINATED	97	0	0	162	97	97	72
ACRES OF DOWNWARD TREND STABILIZED (S) OR REVERSED (R)	S: 4,400	0	R: 4,400	S: 4,400	0	S: 4,400	S: 2,100 R: 2,300
ACRES CHANGING ONE CONDITION CLASS DOWNWARD	4,425	0	0	5,075	8,850	4,115	2,125
HERBAGE YIELDS, POUNDS/ACRE/YEAR a/	502	560	502	502	502	560	502
PLANT COVER, PERCENT b/	20.4	20.5	20.6	20.3	20.3	20.5	20.5
WIND EROSION, MILLION TONS PER YEAR	22.0	21.6	21.2	22.2	22.5	21.6	21.6
SEDIMENT YIELD, ACRE-FEET PER YEAR	319.1	303.9	289.4	325.2	334.3	303.9	303.9
SOIL STRUCTURE ALTERED, ACRES	800	7	0	970	1,600	720	490
WATER USE, ACRE-FEET PER YEAR	135	86	77	165	140	119	126
ACRES RATED SUITABLE FOR LIVESTOCK	242,900	229,650	0	326,950	242,900	242,900	216,400

a. Values reflect conditions in the existing fourteen pastures.
b. A change from 20.5 to 20.4% cover is described in text as a 0.5% change (20.5/20.4 = 1.005).
Source: Lee Wilson and Associates, Santa Fe, NM.

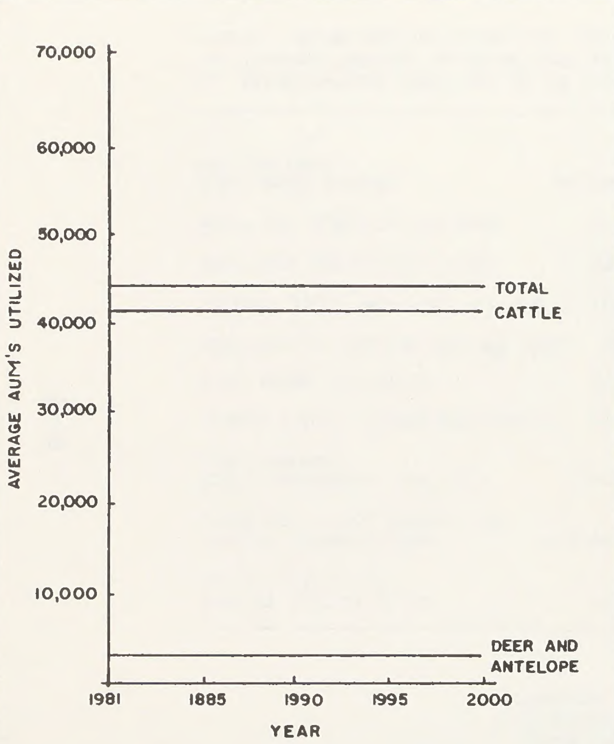


FIGURE 8-1A. UTILIZATION OF FORAGE: ALTERNATIVE A, NO ACTION - CONTINUE EXISTING PROGRAM (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

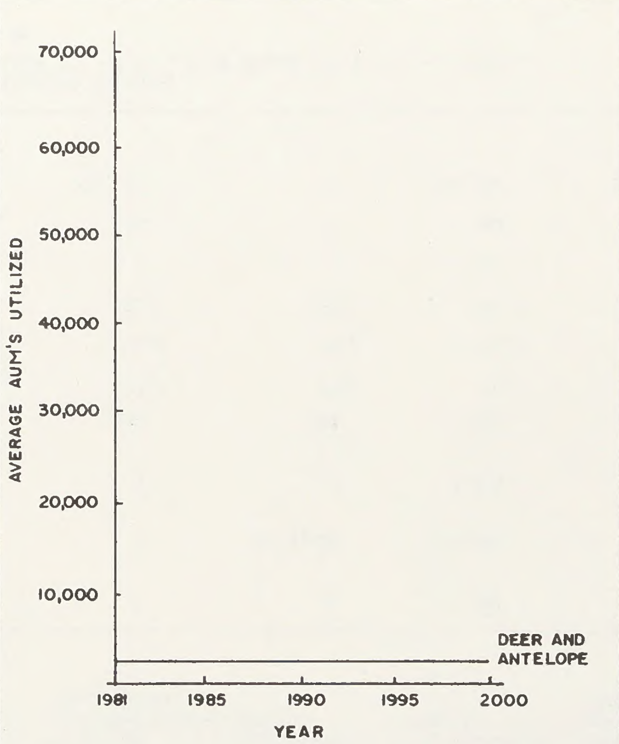


FIGURE 8-1B. UTILIZATION OF FORAGE: ALTERNATIVE B, DISCONTINUE LIVESTOCK GRAZING (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

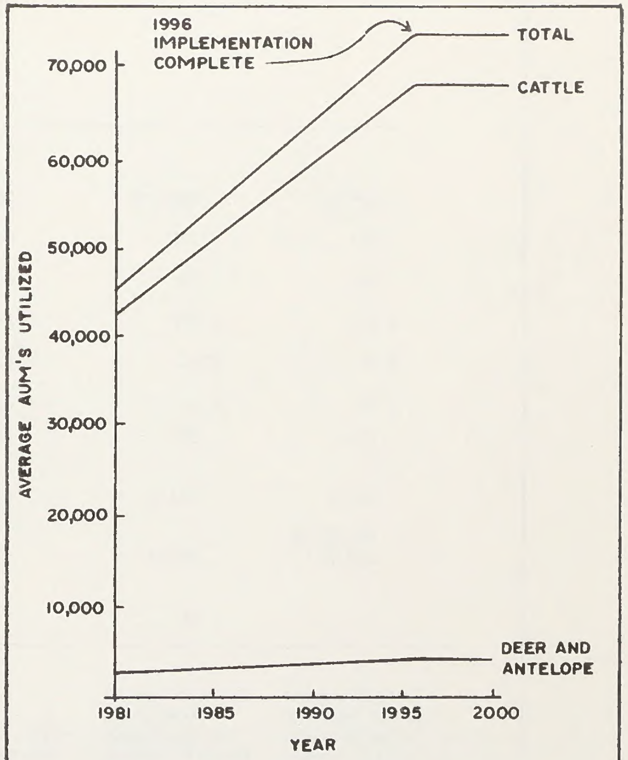


FIGURE 8-1C. UTILIZATION OF FORAGE: ALTERNATIVE C, ADD GRAZING IN AREA A (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

SOURCE: BLM, Las Cruces District

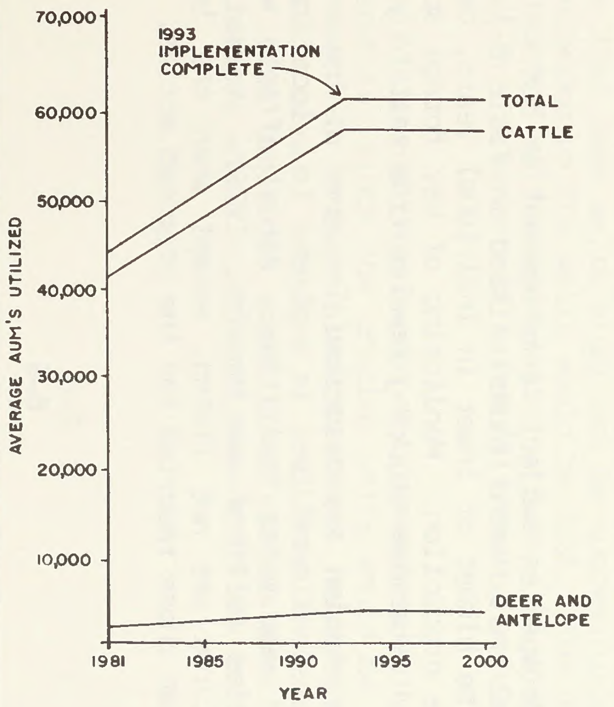


FIGURE 8-1D. UTILIZATION OF FORAGE: ALTERNATIVE D, CHANGE GRAZING SEASON TO OCTOBER-MARCH (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

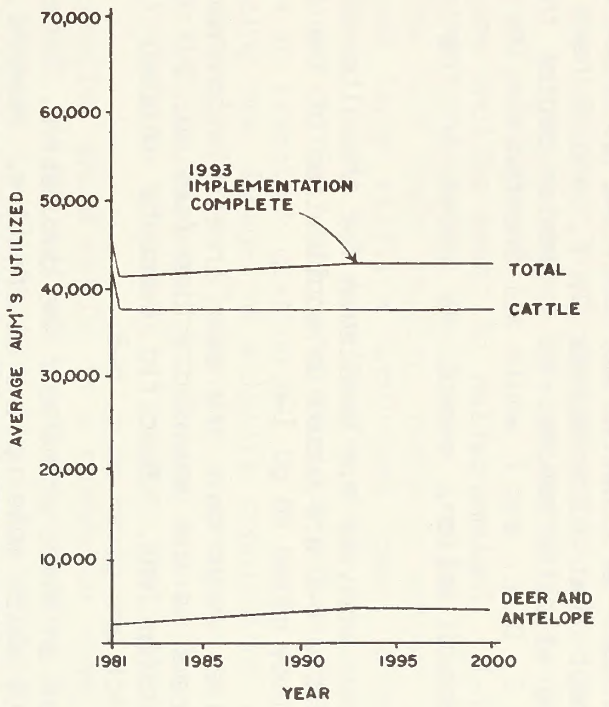


FIGURE 8-1E. UTILIZATION OF FORAGE: ALTERNATIVE E, CHANGE GRAZING SEASON TO OCTOBER-MARCH AND REDUCE GRAZING (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

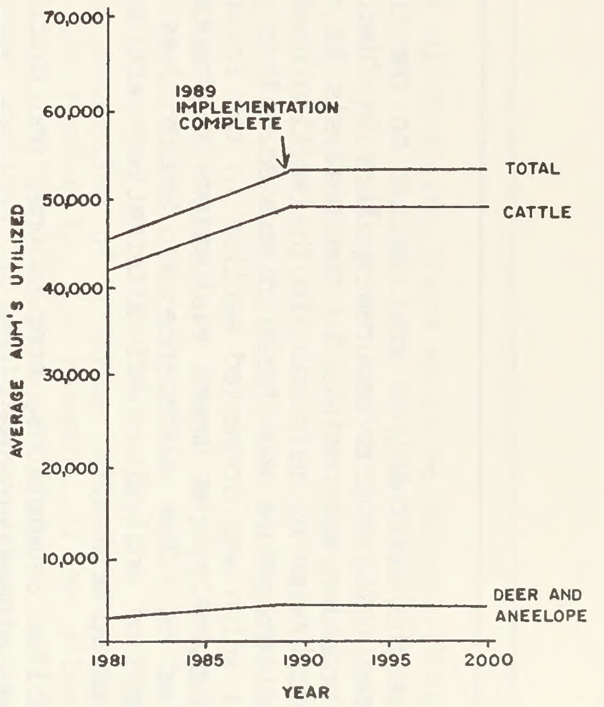


FIGURE 8-1F. UTILIZATION OF FORAGE: ALTERNATIVE F, REDUCE GRAZING IN PASTURES 3,4 & 5; PROVIDE FOR SUMMER GRAZING (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

SOURCE: BLM, Las Cruces District

To the extent that the alternatives are similar to the proposed action, impacts may be analyzed using the procedures applied in Chapter 3. In such cases, background information appropriate to the analysis is not repeated in Chapter 8, but is incorporated by reference to the section or pages in Chapter 3 where the analytical procedure was first discussed. This approach avoids repetition of material which was presented earlier in the Environmental Impact Statement (EIS). Consequently, the impact evaluations in Chapter 8 are shorter than those in Chapter 3. The difference in length does not reflect a difference in the depth of analysis. All alternatives are evaluated to the same extent as the proposed action.

The following specific assumptions, conclusions, and discussions apply to all alternatives, unless otherwise noted.

1. Objectives of each alternative are the same as those of the proposed action (p. 1-1), except that Alternatives D, E, and F have the additional objective of improving wildlife habitat to a greater degree than the proposed action. Alternatives C, D, E, and F would all incorporate the design features set forth in Table 1-1. Implementation of these options would generally be similar to the proposed action, except as noted in the descriptions of Alternatives C and F.

2. No benefit-cost analyses are available for the alternatives. Benefits and costs stated in Table 8-1 are based on application of the information used in the benefit-cost study cited on p. 1-6.

3. All alternatives would have the same interrelationships with Federal, State and local programs as the proposed action (see pp. 1-9 to 1-11), except as noted in the descriptions. Specific comments related to the National Environmental Policy Act are given on p. 8-8.

4. The impacts of an alternative are the cumulative, interrelated results of all of the elements which make up the alternative. However, to more easily organize the discussions, impacts are generally presented in a form which ties specific changes to specific actions, and summaries are used to identify the cumulative effects.

5. The key forage species subject to management by BLM are those listed on p. 3-2. Actual Animal Unit Months (AUMs) listed in Table 8-1 and illustrated in Figure 8-1 could be higher or lower in individual years, depending on precipitation and forage production. Monitoring of key forage species and wildlife populations would determine stocking leveles from year to year.

6. Impacts on vegetation are described in terms of the entire, rangewide resource. Specific consideration is given to localized changes at constructionsites and near water facilities. Actual effects would vary among communities and species (Gifford and Hawkins, 1976). Variations in impacts among different pastures are not listed, except when the impacts would be markedly different than those reported for the proposed action.

7. Under all alternatives there would be natural changes in plant composition and range condition in portions of the Co-use area. The changes would include the natural cycle of growth and decline of broom snakeweed, and the gradual expansion of creosotebush into areas where soil and climate conditions are favorable (see p. 3-19). Deterioration in condition which results from ongoing natural processes is not considered to be an impact of any alternative.

8. Quantification of impacts is based on the assumption that differences between alternatives and the proposed action would be in direct proportion to differences in utilization or differences in the acreage affected by water facilities. This assumption of a linear relationship is consistent with the literature cited in Chapter 3. For example, if an alternative involves five percent less utilization than the proposed action (that is, 45 percent utilization of key forage species), it would be expected to have five percent less utilization-related impacts than the proposed action. An alternative which would cause heavy grazing on 4,400 acres would be expected to have approximately one-half the impact of the proposed action which involves heavy grazing on 8,825 acres. In cases where this assumption is not appropriate, more specific procedures are followed.

9. None of the alternatives would have a major impact on wildlife resources. Based on the 1979 field studies, there is minimal competition for food between cattle and large wildlife herbivores (deer, antelope) under existing conditions. Further, Table 3-3 demonstrates that adequate forage is available to support increased cattle, deer, and antelope populations. Alternatives that involve increases in livestock grazing (C, D, F) would use monitoring to ensure that no overgrazing and damage to wildlife populations occurs (see Appendix B). Other alternatives (A, B, E) involve a decrease or no change in cattle grazing, hence no increased demand for forage resources. Principal impacts on wildlife impacts relate to minor habitat changes near water facilities.

10. No alternative would result in a change in cover which would significantly affect runoff. Under all alternatives, changes in water quality would be minimal, and limited to slight variations in turbidity, salinity, and bacteria in surface water. No alternative would affect the availability or quality of ground water. For all alternatives involving new wells (C, D, E, F), there is the risk that some wells might not be successfully completed, in which case the funds expended on the wells would be lost. The discussions in Chapter 8 focus on impacts that differ among alternatives. In most cases, such impacts relate to changes in the amount of water utilized by animals and lost to evaporation.

11. Under all alternatives except B, lessees would continue to be relatively large operators, since the grazing units would be relatively large and leases would be awarded to high bidders. Most lessees would purchase cattle prior to the grazing season, and send or sell them to feedlots when the season is over. A few local operators would lease parcels near or adjacent to their lands, but most lessees would be from elsewhere in New Mexico or from adjoining states.

12. Under all alternatives, research on black grama grasslands would continue (see p. 2-45).

13. Existing levels of energy use are small. None of the alternatives would change this basic situation. Thus, neither the proposed action nor any alternative would have a significant impact on energy resources.

RELATIONSHIP TO NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

Objectives of NEPA are set forth on p. 1-9. While all alternatives would maintain the environment for succeeding generations (objective 1), Alternatives C and D would allow more adverse environmental change than the other options or the proposed action, while Alternatives A, B, E and F would allow less change. Objectives 2 and 6 establish policies regarding resource productivity and use. The alternatives vary considerably with regard to the potential productivity of the Range, especially productivity which is harvested so as to balance population and resource use (objective 5). In order of decreased harvest, the alternatives are: C (most production harvested), D and the proposed action, F, A, E, and B. Alternative B would eliminate, and Alternative E would reduce, the productive benefits from McGregor Range compared to existing conditions. Alternative A would maintain use at present levels, while Alternative F would provide some increases and Alternative D considerable increases. Alternative C is the only option which goes well beyond the proposed action toward increasing the harvest of production from the Range.

The primary military mission of McGregor Range limits the scope of every alternative, and restricts BLM's ability to manage for a wide range of beneficial uses (objective 3) and for a variety of individual choices (objective 4). Within the limitations, the proposed action and Alternatives C, D, E, and F expand one or more of the beneficial uses of the land, while Alternative B reduces beneficial uses of the Range, and Alternative A foregoes opportunities to expand the uses. All options would incorporate design features to mitigate against damage to environmental resources (objectives 3 and 4), with the exception of Alternative B, which would have no direct adverse impacts.

RELATIONSHIP TO FEDERAL LAND POLICY AND MANAGEMENT ACT AND PUBLIC RANGELANDS IMPROVEMENT ACT

As discussed on p. 1-10, these laws establish a policy to improve the productivity of land under BLM management. Alternative B does not fulfill this policy. The other alternatives are compatible with the policy. However, only the proposed action and Alternative C would both address problems of land in poor condition and manage the land so that harvested productivity approaches the long-term potential of the area.

ALTERNATIVE A. NO ACTION (CONTINUE EXISTING PROGRAM)

Under Alternative A, BLM would continue its existing program (p. 2-43) without the management changes described in Chapter 1. New improvements would not be constructed, a range conservationist would not be hired, and BLM would not undertake an expanded monitoring effort. As part of the ongoing program, the main pipeline would be replaced, existing improvements would continue to be maintained, the cooperative agreements outlined in Appendix B would continue in effect, and a limited amount of monitoring would be performed. Forage would continue to be sold at public auction, the grazing season would continue to be nine months long (with a summer rest), and average AUMs would be unchanged from present levels. Table 8-1 summarizes elements of this alternative.

VEGETATION

TYPES OF IMPACTS

The No Action Alternative would alter vegetation through the replacement of the main pipeline. Impacts experienced under the existing management program would continue.

UTILIZATION

Utilization patterns under existing conditions would persist if the No Action Alternative is implemented (see p. 2-10, Figure 2-3, Table 2-4).

PRODUCTIVITY

The replacement of the main pipeline would cause disturbance or removal of vegetation on 7 acres. The sites would be covered by weeds in the first growing season after construction, and would gradually progress toward climax vegetation. No significant change in long-term herbage yields would be expected. For the grazed area as a whole, the productivity levels measured during the 1979 field season are considered a reasonable (and perhaps conservative) estimate of the probable long-term herbage yields sustained under existing conditions. Table 3-3 provides estimates of the existing yields by pasture.

CONDITION AND TREND

Heavy forage utilization and trampling would continue on the 4,400 acres of poor-condition range which surround existing water facilities. A downward trend in condition would continue in these areas, and would be associated with continued reductions in forage production, canopy cover, and plant vigor. Alternative A would maintain the existing fair to good condition and stable trend away from water.

POISONOUS PLANTS

Poisonous plants would remain a relatively minor component of the vegetation on McGregor Range if the No Action Alternative is implemented. Toxic plants would continue to increase around some water facilities, especially in the Bolson.

THREATENED OR ENDANGERED PLANTS

The Kuenzler hedgehog cactus, an endangered species, would not be affected by Alternative A, since it is a hardy species which can survive in areas of light to moderate grazing.

OTHER IMPACTS

Cover. Continued heavy use near water would maintain a canopy cover which is perhaps half as dense as that which occurs on locations farther from water (see p. 3-17). Basal cover could be slightly greater on these 4,400 near-water acres.

Vigor. The low level of utilization in most areas would allow plants to stagnate. Regrowth following grazing would be limited, and litter accumulation would adversely affect tillering. Thus plant vigor would not be at optimum levels if Alternative A is undertaken.

Litter; fires. The build-up of litter and standing dead material would maintain the amount of fuel at a moderately high level. This would tend to favor the spread of natural and military-related fires, which presently burn 5,000 acres per year (p. 2-44).

SUMMARY

The No Action Alternative would cause no changes in forage utilization or grazing management, and thus would essentially maintain the existing environmental conditions on McGregor Range. There would be no alteration in the basic character of the vegetation resource. Existing productivity levels would be sustained, but most of the herbage would not be harvested. Replacement of the main pipeline would cause the short-term loss of 7 acres of productive vegetation. A downward trend in range condition would continue on 4,400 acres near existing water facilities. On these acres there would be continued deterioration in productivity, cover, and vigor. Elsewhere, no change would be evident in plant productivity or cover, except changes due to natural causes or existing grazing pressure. Stagnation would be evident over large areas, due to non-use of forage. The accumulation of litter and standing dead material would remain high.

PHYSICAL SETTING

No impacts on climate, topography or geology would occur. There would be temporary equipment emissions and dust associated with the scheduled replacement of 17.5 miles of existing pipeline. Construction equipment would produce temporary, localized noise levels of 65 to 70 decibels (dBA), with peaks to 80 dBA measured at a distance of 50 feet from the equipment (EPA, 1977). This noise would produce temporary disturbance on 17.5 acres of wildlife habitat.

SOILS

Wind erosion and sediment yield would not be affected by Alternative A. Existing impacts around water facilities (such as compaction and reduced infiltration capacity) would continue. Soil structure would be disturbed on the 7 acres associated with pipeline replacement.

WATER

Under Alternative A, consumption of water by cattle and wildlife would equal 50 acre-feet per year, while evaporation from water storages would equal 36 acre-feet per year.

WILDLIFE

Game animals. Alternative A would maintain the deer population at 3,730 animals. Some competition for forage would occur, especially in winter when cattle may browse mountain mahogany. This competition currently has no adverse effects on deer habitat, and may be a benefit because utilization by cattle causes regrowth, increasing the palatability of the vegetation. The antelope population would remain at 253 animals. Antelope may be disturbed by noise from construction activities, but this effect would be extremely limited, and temporary. Alternative A would have no significant effect on game birds except for construction effects, discussed below in the paragraph on other animals.

Small mammals. Alternative A would maintain existing populations of rabbits, rodents, and other small mammals.

Other animals. Construction activities would cause temporary displacement of most species on 7 acres affected by replacement of the main pipeline. The two large colonies of fringed myotis would continue to be vulnerable to vandalism and possible complete destruction during the pupping season. However, the colonies would be more protected than if the proposed action were implemented.

Threatened or endangered species. Alternative A would not affect the peregrine falcon nor any populations of regionally threatened or endangered species which may occur on McGregor Range.

CULTURAL RESOURCES

Alternative A would cause no new impacts on cultural resources. Existing activity would continue.

VISUAL RESOURCES

Under Alternative A, 450 square miles would remain in VRM Class III and 354.7 square miles would remain in VRM Class IV.

WILDERNESS

Alternative A involves no action on public lands being evaluated as to suitability for wilderness (see p. 2-40).

RECREATION

Alternative A would not significantly affect recreational opportunities.

LAND USE

Alternative A does not involve a basic change in the amount of land to be used for different purposes. Further, it contains no components which would conflict with continued use of McGregor Range for military purposes. Within the fourteen pastures, 229,650 acres would remain classified as suitable for livestock grazing, and 41,350 acres (all in the Mountain Foothills and Canyonlands) would continue to be rated as unsuitable due to slope and distance from water.

TRANSPORTATION

Alternative A would involve no components having an impact on transportation.

SOCIO-ECONOMIC CONDITIONS

Benefits to lessees would continue to average $994,800 per year.

SUMMARY OF IMPACTS, CHANGES IN PRODUCTIVITY, AND RESOURCE COMMITMENTS

This section provides information on Alternative A which is similar to the information provided about the proposed action in Chapters 4, 5, 6, and 7.

MITIGATION MEASURES

Alternative A would require no mitigation measures.

UNAVOIDABLE ADVERSE IMPACTS

Adverse impacts from Alternative A would include continued deterioration of range condition on 4,400 acres near existing water facilities. No adverse impacts have been identified which would substantially alter the physical setting, soils, water, wildlife, cultural resources, visual resources, wilderness, recreation, land use, transportation or socio-economic conditions on the Range.

RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Alternative A would forego opportunities to increase the harvest of the long-term production of vegetation on McGregor Range. Potential benefits to the livestock industry and to wildlife populations would not occur. Deterioration in environmental conditions would continue near existing water facilities. These long-term consequences would be the result of unchanged commitments to and funding of grazing management within the Co-use area.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There is no new commitment of resources involved in Alternative A which would be irreversible or irretrievable.

ALTERNATIVE B. DISCONTINUE LIVESTOCK GRAZING

Alternative B would end BLM's involvement on McGregor Range. The Memorandum of Understanding between BLM and the Department of the Army (DOA) would be terminated, as would the cooperative agreements with other entities. Livestock utilization in the fourteen pastures would cease. DOA would have responsibility for maintenance of existing improvements (for example to maintain wildlife water supplies), and for the control of livestock trespass. Figure 8-1b illustrates the wildlife AUMs which would be utilized in 1981-2000. The projection of AUMs is based on a worst-case assumption that DOA would not sustain an active program of wildlife management, and wildlife populations would therefore decrease (see p. 8-17).

VEGETATION

TYPES OF IMPACTS

Alternative B would eliminate impacts of livestock on the vegetation resource. Wildlife impacts on vegetation would also be reduced. The utilization of forage would change from light to slight. Heavy grazing near existing water facilities would be eliminated.

UTILIZATION

Utilization of forage would be limited to the needs of wildlife. The current biomass of grazing wildlife is shown in Table 2-10.

PRODUCTIVITY

The projected decrease in utilization would be expected to reduce productivity within the fourteen pastures. This assumption is consistent with the literature (see p. 3-14). Since almost none of the production would be harvested, productivity would not be a critical factor in the prediction of other impacts. For purposes of comparison to other alternatives, the decrease in production is assumed to be be 10 percent, from 560 to 502 pounds per acre per year. As discussed in the next section, an increase in production would occur in parts of the Range, specifically in those currently overgrazed areas which occur near existing water facilities.

CONDITION AND TREND

Heavy forage utilization and trampling would cease on the 4,400 acres of poor-condition range which surrounds existing water facilities The virtual elimination of grazing pressure would be expected to reverse the downward trend which now occurs in these areas. Forage production, cover, and vigor would be improved. In the remainder of the Co-use area, Alternative B would tend to maintain the existing good or fair condition and stable trend (see p. 3-15).

POISONOUS PLANTS

Poisonous plants would remain a relatively minor component of the vegetation on McGregor Range if the No Grazing Alternative is implemented. Toxic plants would possibly decline around some water facilities, especially in the Bolson, due to the reversal of a downward range trend.

THREATENED OR ENDANGERED PLANTS

The Kuenzler hedgehog cactus, an endangered species, would not be affected by Alternative B.

OTHER IMPACTS

Cover. Elimination of heavy use near water would result in an increase in canopy cover to perhaps double the present levels (see p. 3-17). Basal cover could be slightly lowered on these 4,400 acres. Annual grasses would be expected to increase in relative importance. The increase in cover caused by Alternative B would be at least as great as the decrease projected to result from the proposed action, which is 0.5 percent. A 0.5 percent increase in cover would change average plant density from 20.5 to 20.6 percent of the ground surface.

Vigor; litter; fire. The virtual non-use of forage would cause plants to stagnate. Litter accumulation would substantially increase, which would adversely affect tillering. Thus, plant vigor would decline if the No Grazing Alternative is undertaken. An exception would occur near existing water facilities, where the elimination of heavy grazing would benefit vigor. The rangewide buildup of litter and standing dead material would increase the amount of fuel. This would tend to favor the spread of natural and military-related fires, increasing the acreage burned. Shrubs and cacti which are fire-intolerant would be adversely impacted, while species which are more productive where fires are common (such as tobosa) would benefit.

SUMMARY

The No Grazing Alternative would substantially reduce forage utilization on McGregor Range. In most areas, this action would result in few changes to the existing environmental conditions on McGregor Range, which are already adjusted to relatively light grazing pressure. However, the downward trend in range condition would be reversed on 4,400 acres near existing water facilities. On these acres there would be improvements in productivity, cover, and vigor. Because of these changes, rangewide plant cover would increase by 0.5 percent. Changes in range condition due to natural causes would continue. Plant stagnation would be evident over large areas, due to non-use of forage, and plant vigor would decrease. Because of the stagnation, herbage yields could decline by about ten percent. The accumulation of litter and standing dead material would increase, as would the potential for fires.

PHYSICAL SETTING

No impacts on climate, topography or geology would occur.

Air quality. Implementation of Alternative B would decrease Total Suspended Particulates (TSP) by about two percent in the Co-use area, an amount equal to the predicted change in wind erosion (see discussion on p. 8-16). Air quality standards for TSP would continue to be violated on the Range. Increased burning would increase TSP from smoke. Emissions from propane-fueled pumps and dust and exhaust from grazing-related traffic would cease. None of these changes would be measurable.

Noise. Nearly 400 acres presently experience a noise impact due to traffic or pumping. This impact would be greatly reduced by Alternative B. The change would benefit sensitive wildlife, such as antelope.

Summary. Alternative B would have minor effects on the physical setting of McGregor Range. TSP from wind erosion would decrease by two percent, and emissions and dust from traffic and fuel combustion would cease. TSP from range fires would increase. Noise which results from pump operation and traffic would be eliminated. None of these effects would be measurable.

SOILS

Erosion. Wind erosion and sediment yield would decrease if Alternative B is implemented, because the decreased utilization of forage would be associated with an increase in the protective effects of vegetation. The wind erosion equation uses productivity as a measure of the protective effects of vegetation. In the case of Alternative B, productivity is not adequate as a measure of ground protection, since the decrease in productivity is actually the result of increased litter, which would help stabilize the soil. As an approximate measure of the actual change in erosion, Alternative B is assumed to have effects which are generally similar in magnitude to the proposed action, but (except for productivity) opposite in direction. Thus the change in erosion would be the same as that predicted for the proposed action, but would be a decrease of two percent rather than an increase. Using the same assumptions, there would be a five percent decrease in sediment yield. Both changes are quantified in Table 8-2.

Compaction. Elimination of grazing would allow soils near existing water facilities to expand gradually due to natural weathering processes. The natural processes would require many years before the soil structure is completely restored. With expansion, the infiltration capacity and seed-survival potential of the soils would improve. The total area which would benefit is approximately 800 acres. Additional acreage in corrals would also benefit. The increase in litter would tend to increase soil organic content and moisture-holding capacity, which would decrease fluctuations in soil microenvironment.

Summary. Wind erosion and sediment yield would decrease by two and five percent respectively under Alternative B. The structure of compacted soils around existing water facilities would gradually be improved over a period of many years, increasing infiltration capacity.

WATER

The decrease in cattle and deer AUMs would cause a net decrease in the consumption of water by animals from 50 to 5 acre-feet per year (see p. 3-26). Total use would decrease from 86 to 41 acre-feet per year.

WILDLIFE

Under Alternative B, management of wildlife on McGregor Range would be the responsibility of DOA. For purposes of a worst-case analysis, it is assumed that DOA's management would be less intensive than present management. It is assumed that wells would not be pumped, and pipelines and troughs would not be maintained. Restrictions on hunter access (poaching) would possibly be less effective. Because of these changes, a decrease in deer populations could occur. Increases in antelope populations would not be expected.

Game animals. Because of reduced water availability (and perhaps increased poaching), Alternative B could lead to reductions in the McGregor Range deer herd. Accurate quantification of the change cannot be made with available data. It is assumed that the population would be one-half the optimum which would result from other alternatives (see Table 8-1). Elimination of competition for forage between cattle and deer might benefit deer somewhat. However, it would also eliminate the benefits of cattle utilization, which causes regrowth, increasing the palatability of the vegetation.

Antelope populations would remain near existing levels. As discussed on p. 3-3, plants of special importance to the antelope diet, such as forbs, do not appear to be adversely affected by present levels of grazing. Elimination of grazing would therefore provide few, if any, benefits toward increasing the antelope herd. Noise-related disturbance of antelope near pumping facilities would be eliminated.

In the 4,400 acres near existing water facilities, vegetation changes and decreased trampling would increase the effective habitat available to game birds and could cause an increase in their abundance. Increases would be offset by the decreased availability of water. Dove and Gambel's quail populations would decrease with fewer watering holes, while scaled quail would not be affected.

Small mammals. Alternative B would be expected to maintain existing populations of rabbits, rodents, and other small mammals. Near existing water facilities, elimination of cattle would increase populations and biomass of herbivorous rodents. Species such as the cotton rat and silky pocket mouse would benefit. Habitat diversity would be decreased, and the total number of mammal species near the facilities could decrease for the Range as a whole. Jackrabbit populations would be expected to decrease, while desert cottontail would expand. It is not possible to quantify these impacts, but they would be small due to the limited acreage involved.

Other animals. Some non-game birds, especially ground-nesting species, would be affected in a manner similar to game birds. Populations might increase slightly near water, but diversity could decrease. Most bird species would be adversely affected by the reduced availability of water. Horned lizards and the Mojave rattlesnake on Otero Mesa could benefit from the reduction in trampling, especially during late spring.

Threatened or endangered species. The peregrine falcon and the regionally endangered or threatened species on the Range could benefit from changes in plant cover, decreased cattle trampling, and, in the case of prairie dogs, decreased competition for food. There is no information available on the occurrence of these species on the Range, and no basis for further defining the potential benefits.

Summary. Alternative B would protect many of the environmental conditions which presently support a diverse wildlife population on McGregor Range, but could lead to reductions in deer numbers. Major changes to wildlife habitat

would be limited to areas near existing water facilities, where changes in the vegetation would benefit some species and have adverse effects on others.

CULTURAL RESOURCES

Under Alternative B existing impacts from erosion and military activity would continue although the erosion-related impacts would be reduced. Elimination of cattle trampling would eliminate one significant existing cause of deterioration of cultural resources. The impacts eliminated would include potential damage of ceramic remains at or above the ground surface, and trampling of sites which have a floor or traces of adobe walls. The benefits would be especially important in Pastures 1 and 3, which have a relatively high density of known habitation sites.

VISUAL RESOURCES

Under Alternative B, 450 square miles would remain in VRM Class III and 354.7 square miles would remain in VRM Class IV.

WILDERNESS

Alternative B would eliminate livestock grazing on the three areas within McGregor Range which are currently being evaluated for wilderness potential.

RECREATION

Alternative B would reduce big game hunting opportunities on McGregor Range by an undetermined amount.

LAND USE

Alternative B would eliminate 271,000 acres which are presently available for livestock grazing. The alternative would not affect continued use of McGregor Range for military purposes. The frequency of fires caused by military activity would increase. Wildlife and recreational land uses would decrease.

TRANSPORTATION

Alternative B would eliminate grazing-related traffic. This would have a small impact on vehicle counts. Unless road maintenance were continued, many of the less-travelled roads would deteriorate, and access to portions of the Range could become more difficult for conventional vehicles.

SOCIO-ECONOMIC CONDITIONS

Alternative B would eliminate one type of economic productivity presently supported by the McGregor Range. Existing benefits to lessees of $994,800 would no longer occur. Income to BLM would cease, ending employment for BLM personnel now assigned to the Range.

SUMMARY OF IMPACTS, CHANGES IN PRODUCTIVITY, AND RESOURCE COMMITMENTS

This section provides information on Alternative B which is similar to the information provided about the proposed action in Chapters 4, 5, 6, and 7.

MITIGATION MEASURES

Alternative B would require no mitigation measures.

UNAVOIDABLE ADVERSE IMPACTS

Adverse impacts of Alternative B which relate to big-game populations would be avoided if DOA were as active as BLM in the management of wildlife resources. The most significant unavoidable impact is the elimination of economic benefits to the livestock industry. Vegetative production would be reduced, due to stagnation of unutilized plants. There are no adverse effects on the physical setting, soils, cultural resources, visual resources, wilderness, recreation, or transportation conditions on the Range.

RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Alternative B would forego opportunities to increase the long-term production of vegetation on McGregor Range. Potential benefits to the livestock industry and to wildlife populations would not occur. However, grazing-related deterioration in environmental conditions would stop, and rates of erosion and damage to cultural resources would be decreased. The extent of Federal involvement with grazing resources within the Co-use area would be greatly reduced, and would be limited to DOA's role in wildlife management.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There is no commitment of resources involved in Alternative B which would be irreversible or irretrievable.

ALTERNATIVE C. ADD GRAZING IN AREA A

Alternative C fully incorporates all elements of the proposed action as described in Chapter 1. In addition, Area A would be divided into three pastures and opened for grazing, adding 84,000 acres and providing 11,703 addi-

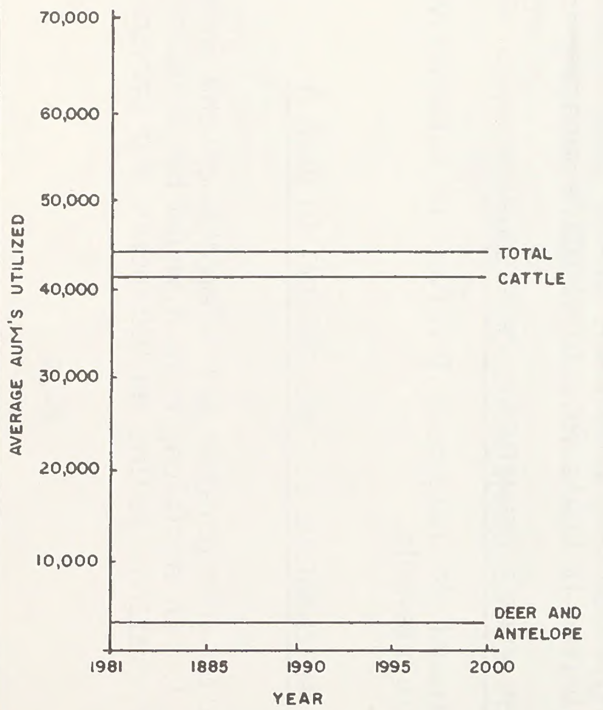


FIGURE 8-1A. UTILIZATION OF FORAGE: ALTERNATIVE A, NO ACTION - CONTINUE EXISTING PROGRAM (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

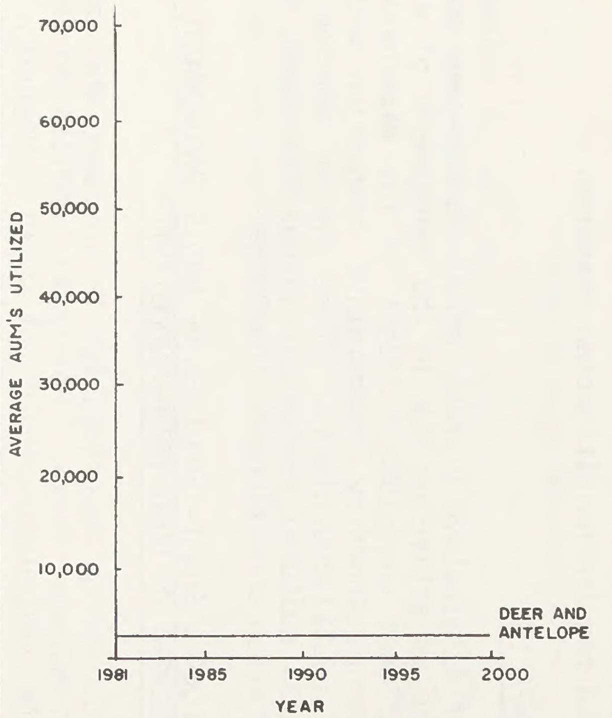


FIGURE 8-1B. UTILIZATION OF FORAGE : ALTERNATIVE B, DISCONTINUE LIVESTOCK GRAZING (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

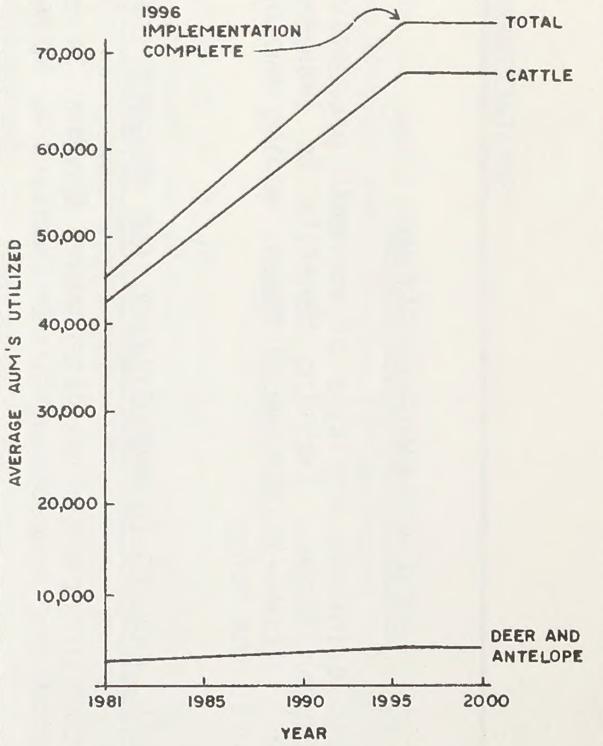


FIGURE 8-1C. UTILIZATION OF FORAGE : ALTERNATIVE C, ADD GRAZING IN AREA A (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

SOURCE: BLM, Las Cruces District

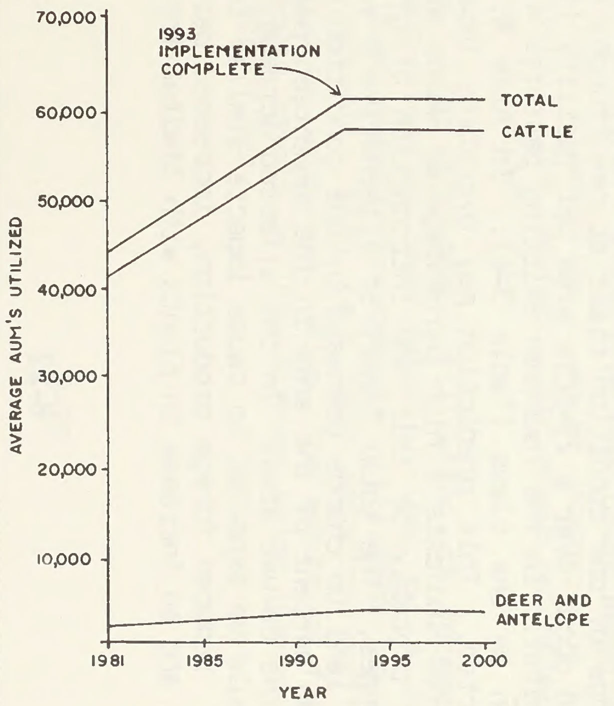


FIGURE 8-1D. UTILIZATION OF FORAGE: ALTERNATIVE D, CHANGE GRAZING SEASON TO OCTOBER-MARCH (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

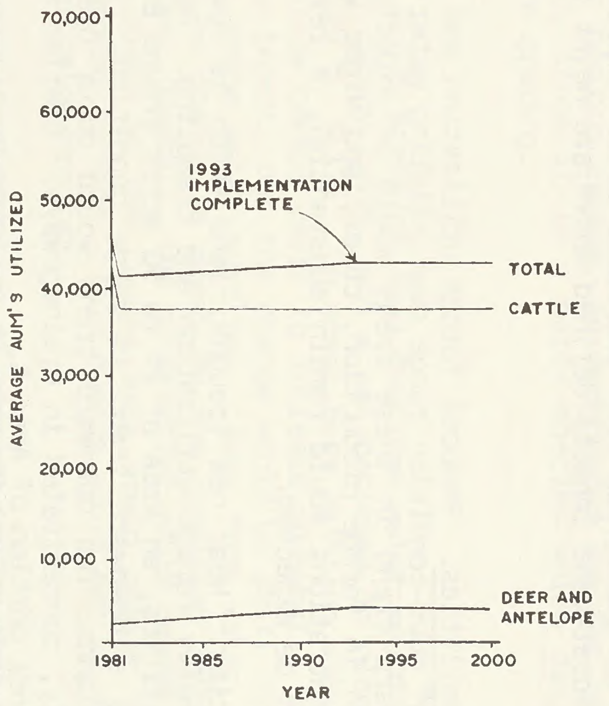


FIGURE 8-1E. UTILIZATION OF FORAGE: ALTERNATIVE E, CHANGE GRAZING SEASON TO OCTOBER-MARCH AND REDUCE GRAZING (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

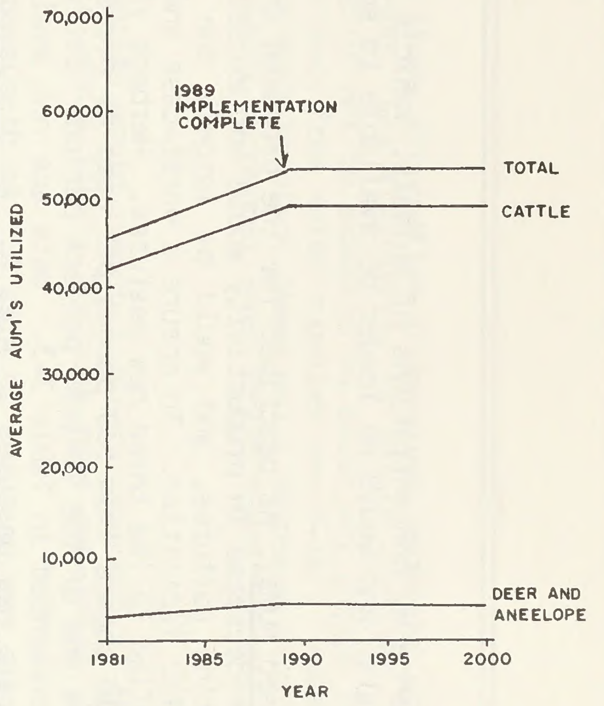


FIGURE 8-1F. UTILIZATION OF FORAGE: ALTERNATIVE F, REDUCE GRAZING IN PASTURES 3,4 & 5; PROVIDE FOR SUMMER GRAZING (EXCLUSIVE OF SMALL MAMMALS & RABBITS)

SOURCE: BLM, Las Cruces District

go continuing disturbance by concentrations of animals, vehicle traffic or periodic inundation by water and would no longer be available to support livestock or wildlife.

Effects of increased AUMs. As described for the proposed action (p. 3-14), it is assumed that the decrease in productivity would not exceed a value of ten percent in the existing pastures, and would be largely due to grazing and trampling near new water facilities. To ensure a worst-case analysis, the same assumption can be applied to the three new pastures. Herbage yields within the fourteen pastures would change from 560 pounds per acre at present to about 502 pounds per acre by the end of the 20-year project period. Estimates of changes in each pasture are presented in Table 3-3. Data are not available to expand Table 3-3 to incorporate new pastures in Area A. As discussed in the section on vigor, Alternative C would have some beneficial effects on productivity. These benefits cannot be quantified with available data. Improved vigor should help ensure that the worst-case impacts defined above are never reached.

CONDITION AND TREND

Existing water facilities. Reduced forage utilization and trampling would improve 4,400 acres of poor-condition range near existing water facilities (see p. 3-15). The downward trend in these areas would be expected to slow, and existing deterioration in forage production, cover, and vigor would slow. Because livestock concentrations would remain substantial, a reversal toward an upward trend would not be expected.

New water facilities. Near new troughs, land which is now lightly grazed would be subject to heavy forage utilization and trampling. Based on comparisons to existing facilities, an area of 25 to 50 acres around each supply would be likely to develop a downward trend in range condition. In the Mountain Foothills and Canyonlands, the downward trend would occur over a 100 to 200 acre area per facility, concentrated in drainageways. Similar effects would be expected in the Rimlands portion of Area A.

An analysis of the impacts of new water facilities is given on p. 3-15, and indicates that a change of one condition class at new troughs would be expected. This change would occur over a 25-acre area per facility (100 acres in the Upland and Rimland units). In the fourteen existing pastures 4,425 acres would decrease in condition by one class (Table 3-4). In Area A, 650 additional acres would be affected. This prediction may overstate impacts in Area A, since field observations indicate a high percentage of weeds at present. Condition ratings would probably be fair and introduction of grazing might not cause substantial changes. The total impact of Alternative C would be to cause about 5,075 acres of land to change downward by one condition class. This represents less than two percent of the area in the seventeen pastures, and less than one percent of the Co-use area. In the affected acreage, forage utilization and trampling would be expected to cause impacts similar to those observed near existing water: reduced forage production, increased bare ground, a decline in plant vigor, and an increase in plants with limited forage value.

Rangewide. Since Alternative C involves moderate utilization of forage, growing-season rest, and flexibility to adjust stocking levels, the increased number of AUMs would not be expected to cause any change in condition classification for areas away from water supplies (p. 3-16). However, the abundance of sensitive species such as black grama would decrease in any area where utilization is significantly increased, even though condition did not change.

POISONOUS PLANTS

Poisonous species would remain a minor component of the environment on McGregor Range, but would likely increase near new water facilities, especially in the Bolson.

THREATENED OR ENDANGERED PLANTS

The Kuenzler hedghog cactus, an endangered species, would not be affected by Alternative C, since it is a hardy species which can survive in areas of light to moderate grazing.

OTHER IMPACTS

Cover. The 5,075 acres of land near new water would experience a substantial decrease in canopy cover, and a net decrease in plant density of as much as 50 percent (see p. 3-17). On areas near existing water facilities, reduced grazing should allow canopy cover to increase somewhat. Data are not available to quantify this impact, but the change would be small since grazing would remain heavy near these water supplies. Away from water, Alternative C would cause little or no change in areas on the remaining 349,925 acres within the seventeen pastures. Overall, the alternative would reduce cover by one percent (see p. 3-18); cover in the Co-use area would change from 20.5 to to 20.3 percent of the ground surface. This change would not be detectable in any type of rangewide monitoring program.

Vigor. The continued practice of growing-season rest would allow most forage species to go through their growth cycle largely undisturbed, thus promoting a high level of vigor. Where livestock graze areas which are now ungrazed or lightly utilized. Alternative C would improve the vigor of many forage species (see p. 3-18). The improved vigor would potentially offset some of the predicted decrease in productivity.

Litter, fire. The increased utilization of forage would substantially reduce litter and standing dead material (see p. 3-18). The change from nongrazing and light grazing to moderate utilization would decrease litter by as much as 50 percent. With less dead material available, the amount of exposed soil would be increased. Also, the amount of fuel for fires would be reduced. This would result in less acreage being burned each year by natural and military-related fires.

12. Under all alternatives, research on black grama grasslands would continue (see p. 2-45).

13. Existing levels of energy use are small. None of the alternatives would change this basic situation. Thus, neither the proposed action nor any alternative would have a significant impact on energy resources.

RELATIONSHIP TO NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

Objectives of NEPA are set forth on p. 1-9. While all alternatives would maintain the environment for succeeding generations (objective 1), Alternatives C and D would allow more adverse environmental change than the other options or the proposed action, while Alternatives A, B, E and F would allow less change. Objectives 2 and 6 establish policies regarding resource productivity and use. The alternatives vary considerably with regard to the potential productivity of the Range, especially productivity which is harvested so as to balance population and resource use (objective 5). In order of decreased harvest, the alternatives are: C (most production harvested), D and the proposed action, F, A, E, and B. Alternative B would eliminate, and Alternative E would reduce, the productive benefits from McGregor Range compared to existing conditions. Alternative A would maintain use at present levels, while Alternative F would provide some increases and Alternative D considerable increases. Alternative C is the only option which goes well beyond the proposed action toward increasing the harvest of production from the Range.

The primary military mission of McGregor Range limits the scope of every alternative, and restricts BLM's ability to manage for a wide range of beneficial uses (objective 3) and for a variety of individual choices (objective 4). Within the limitations, the proposed action and Alternatives C, D, E, and F expand one or more of the beneficial uses of the land, while Alternative B reduces beneficial uses of the Range, and Alternative A foregoes opportunities to expand the uses. All options would incorporate design features to mitigate against damage to environmental resources (objectives 3 and 4), with the exception of Alternative B, which would have no direct adverse impacts.

RELATIONSHIP TO FEDERAL LAND POLICY AND MANAGEMENT ACT AND PUBLIC RANGELANDS IMPROVEMENT ACT

As discussed on p. 1-10, these laws establish a policy to improve the productivity of land under BLM management. Alternative B does not fulfill this policy. The other alternatives are compatible with the policy. However, only the proposed action and Alternative C would both address problems of land in poor condition and manage the land so that harvested productivity approaches the long-term potential of the area.

ALTERNATIVE A. NO ACTION (CONTINUE EXISTING PROGRAM)

Under Alternative A, BLM would continue its existing program (p. 2-43) without the management changes described in Chapter 1. New improvements would not be constructed, a range conservationist would not be hired, and BLM would not undertake an expanded monitoring effort. As part of the ongoing program, the main pipeline would be replaced, existing improvements would continue to be maintained, the cooperative agreements outlined in Appendix B would continue in effect, and a limited amount of monitoring would be performed. Forage would continue to be sold at public auction, the grazing season would continue to be nine months long (with a summer rest), and average AUMs would be unchanged from present levels. Table 8-1 summarizes elements of this alternative.

VEGETATION

TYPES OF IMPACTS

The No Action Alternative would alter vegetation through the replacement of the main pipeline. Impacts experienced under the existing management program would continue.

UTILIZATION

Utilization patterns under existing conditions would persist if the No Action Alternative is implemented (see p. 2-10, Figure 2-3, Table 2-4).

PRODUCTIVITY

The replacement of the main pipeline would cause disturbance or removal of vegetation on 7 acres. The sites would be covered by weeds in the first growing season after construction, and would gradually progress toward climax vegetation. No significant change in long-term herbage yields would be expected. For the grazed area as a whole, the productivity levels measured during the 1979 field season are considered a reasonable (and perhaps conservative) estimate of the probable long-term herbage yields sustained under existing conditions. Table 3-3 provides estimates of the existing yields by pasture.

CONDITION AND TREND

Heavy forage utilization and trampling would continue on the 4,400 acres of poor-condition range which surround existing water facilities. A downward trend in condition would continue in these areas, and would be associated with continued reductions in forage production, canopy cover, and plant vigor. Alternative A would maintain the existing fair to good condition and stable trend away from water.

acres near new water facilities. Soil moisture and infiltration capacity would be reduced and erosion would increase near the new facilities, while the opposite effect would be observed at existing facilities.

WATER

The increase in cattle, deer and antelope AUMs would cause a net increase in the consumption of water by animals from 50 to 81 acre-feet per year. The amount of surface area in troughs and water storages would increase from 6 to 14 surface acres, increasing evaporation losses from 36 to 84 acre-feet per year (see p. 3-26). Total water use would increase from 86 to 165 acre-feet per year.

WILDLIFE

Game animals. Alternative C would cause optimal deer populations to be reached (see p. 3-27). Estimates of deer AUMs are presented in Table 3-3. Alternative C (as well as the proposed action and Alternatives D, E, and F) would cause deer populations to increase in Areas A and B. For the fourteen pastures, deer populations would change from 3,730 to 5,096, while for the entire Co-use area, the change would be from 4,155 to 6,919. As deer tend to avoid areas where cattle numbers are high, areas near new water might no longer be considered as primary deer habitat.

NMDGF estimates optimal antelope densities at 4 per square mile in the Mesa natural unit. Table 3-6 lists the projected antelope populations, by pasture. AUM equivalents are given in Table 3-3. The herd size is projected to increase from 253 to 689 animals.

In the 5,075 acres near new water facilities, habitat changes and increased trampling would reduce the effective habitat available to game birds, and would cause a decrease in species abundance. Reductions would be offset to some extent because of the increased availability of water. Dove and Gambel's quail populations would increase with more watering holes, while scaled quail would probably not be affected. Overall, the anticipated change would be expected to be small, as substantial unaltered habitat would remain throughout the Range.

Small mammals. Alternative C would be expected to maintain existing populations of small mammals, except that populations and biomass of herbivorous rodents would be reduced on heavily grazed areas near new water. Species such as the silky pocket mouse and the cotton rat would be most affected. The new water would enhance habitat for some types of wildlife by creating a more diverse environment, and by causing some changes in the species composition of the plant cover (reflected by the deterioration in range condition in these areas). The total number of mammal species near the facilities would increase for the Range as a whole. Jackrabbit populations would be expected to increase, while desert cottontail would decline. It is not possible to quantify these impacts, but they would be small due to the limited acreage involved.

Other animals. Construction activities would permanently destroy small areas of habitat. Temporary displacement of most species would occur near sites of active construction. New fences (such as at corrals) would provide perch sites for birds and lizards. Perches at new water facilities would have the same benefit. Populations of some non-game birds, especially ground-nesting species, might decline slightly near water. However, because of changes in plant composition near new water, other species would benefit, and overall bird diversity in these areas would increase. Seasonal use of the area by waterfowl may increase slightly. Most bird species would benefit from the additional availability of water. The vegetation changes would have minimal effects on most reptiles so long as no grazing occurs in the summer months. However, some adverse impacts would occur near new water facilities. For example, the horned lizard and Mojave rattlesnake on Otero Mesa could be affected by increased trampling, especially during late spring. Improved access along routes to water would open areas to possible poaching and habitat destruction. The two large colonies of fringed myotis would continue to be vulnerable to vandalism and possible destruction during the pupping season.

Threatened or endangered species. Effects on threatened or endangered species would be limited to a reduction in potential habitat caused by changes in range condition near new water facilities. This may have a minor effect on the peregrine falcon and on regionally threatened or endangered species.

Summary. Alternative C would generally protect or enhance the environmental conditions which presently support a diverse wildlife population on McGregor Range. Forage sufficient for wildlife needs would remain available even though livestock grazing would increase. Major changes to wildlife habitat would be limited to areas near proposed improvements, especially water facilities, where changes in the vegetation would benefit some species and have adverse effects on others.

Increased availability of water and more intensive management would allow deer and antelope populations to increase. More intense cattle grazing would not impair the habitat of either of these large herbivores. Optimal populations of 5,096 deer (3,597 AUMs) and 689 antelope (435 AUMs) would be reached in the existing fourteen pastures, although factors other than food and water could play a role in limiting growth of the herds. Populations of other wildlife species would generally be maintained.

Introduction of water facilities would benefit species that can utilize the water or associated perch sites, or that are favored by decreases in cover and a greater diversity in vegetation. Animal species likely to be favored by new water facilities would include jackrabbits and waterfowl. The change in cover and vegetation would adversely impact other species, including scaled quail, cottontails, ground-nesting birds, horned lizards, and the Mohave rattlesnake.

CULTURAL RESOURCES

Alternative A would cause no new impacts on cultural resources. Existing activity would continue.

VISUAL RESOURCES

Under Alternative A, 450 square miles would remain in VRM Class III and 354.7 square miles would remain in VRM Class IV.

WILDERNESS

Alternative A involves no action on public lands being evaluated as to suitability for wilderness (see p. 2-40).

RECREATION

Alternative A would not significantly affect recreational opportunities.

LAND USE

Alternative A does not involve a basic change in the amount of land to be used for different purposes. Further, it contains no components which would conflict with continued use of McGregor Range for military purposes. Within the fourteen pastures, 229,650 acres would remain classified as suitable for livestock grazing, and 41,350 acres (all in the Mountain Foothills and Canyonlands) would continue to be rated as unsuitable due to slope and distance from water.

TRANSPORTATION

Alternative A would involve no components having an impact on transportation.

SOCIO-ECONOMIC CONDITIONS

Benefits to lessees would continue to average $994,800 per year.

SUMMARY OF IMPACTS, CHANGES IN PRODUCTIVITY, AND RESOURCE COMMITMENTS

This section provides information on Alternative A which is similar to the information provided about the proposed action in Chapters 4, 5, 6, and 7.

MITIGATION MEASURES

Alternative A would require no mitigation measures.

UNAVOIDABLE ADVERSE IMPACTS

Adverse impacts from Alternative A would include continued deterioration of range condition on 4,400 acres near existing water facilities. No adverse impacts have been identified which would substantially alter the physical setting, soils, water, wildlife, cultural resources, visual resources, wilderness, recreation, land use, transportation or socio-economic conditions on the Range.

RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Alternative A would forego opportunities to increase the harvest of the long-term production of vegetation on McGregor Range. Potential benefits to the livestock industry and to wildlife populations would not occur. Deterioration in environmental conditions would continue near existing water facilities. These long-term consequences would be the result of unchanged commitments to and funding of grazing management within the Co-use area.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There is no new commitment of resources involved in Alternative A which would be irreversible or irretrievable.

ALTERNATIVE B. DISCONTINUE LIVESTOCK GRAZING

Alternative B would end BLM's involvement on McGregor Range. The Memorandum of Understanding between BLM and the Department of the Army (DOA) would be terminated, as would the cooperative agreements with other entities. Livestock utilization in the fourteen pastures would cease. DOA would have responsibility for maintenance of existing improvements (for example to maintain wildlife water supplies), and for the control of livestock trespass. Figure 8-1b illustrates the wildlife AUMs which would be utilized in 1981-2000. The projection of AUMs is based on a worst-case assumption that DOA would not sustain an active program of wildlife management, and wildlife populations would therefore decrease (see p. 8-17).

VEGETATION

TYPES OF IMPACTS

Alternative B would eliminate impacts of livestock on the vegetation resource. Wildlife impacts on vegetation would also be reduced. The utilization of forage would change from light to slight. Heavy grazing near existing water facilities would be eliminated.

Physical setting. Effects of Alternative C on the physical setting of McGregor Range would generally be too small to measure. TSP would increase by an estimated three percent due to increased wind erosion. Construction would cause localized temporary emissions of air pollutants and an increase in noise levels to 65 to 70 decibels (with peaks to 80 decibels).

Soils. Wind erosion would increase by about three percent and sediment yield would increase by about seven percent. Construction of improvements would disrupt soil structure on 183 acres. Cattle trampling would increase soil compaction on a total of 970 acres.

Water. Water consumption by cattle and wildlife would increase from 50 to 81 acre-feet per year. Evaporation would increase 36 to 84 acre-feet per year.

Wildlife. Alternative C would have no substantial adverse effects on the overall wildlife resource on McGregor Range. Near new water sources, increased use of forage by cattle and resulting decreases in forage production and canopy cover would reduce populations and biomass of herbivorous rodents, cottontails, and some bird and predator species. In these areas, horned lizards and the Mojave rattlesnake could be adversely affected by increased trampling. Temporary displacement of deer, antelope, game birds, and small vertebrates would occur near active construction sites. Construction would permanently destroy 162 acres of wildlife habitat.

Cultural resources. Mitigation measures would minimize the effect of Alternative C on cultural resources. However, resources would be affected by increased trampling and rubbing by cattle, especially in areas near new water facilities.

Other resources. No adverse impacts have been identified which would substantially alter visual resources, wilderness, recreation, land use, transportation, or socio-economic conditions.

RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The alternative involves a tradeoff between: 1) increased benefits from the harvest of vegetation by cattle, deer, and antelope, accompanied by stabilized range condition in presently overgrazed areas; and 2) decreased production of vegetation, associated with substantial adverse environmental changes near new water facilities. The tradeoff would bring forage production and utilization into a balance, unlike the existing situation where productivity is high but utilization is light. The balanced production and harvest would provide a sustained yield of vegetation at a level which would support about 66 percent more herbivore grazing than now occurs.

All significant benefits and impacts from Alternative C relate to the long-term use of the Range over a 20-year period or beyond. Benefits from the project include: conversion of 97,500 acres from potentially suitable to suitable for grazing; a more even distribution of livestock within the existing

pastures; stabilization of the downward trend in condition near existing water supplies; an increase in forage utilization; an increase in plant vigor in areas now subject to light or slight utilization; protection of forage and provision of water for large game animals (deer, antelope); an increase in livestock numbers and AUMs; and an increase in income within the private cattle industry of about $804,300 per year.

The improved distribution of animals and the increase in forage harvest would cause the following losses in productivity: 162 acres of grazing land and wildlife habitat would be permanently lost; range condition would decrease by one class on about 5,075 acres; forage production would decrease by no more than ten percent; plant cover would decrease by one percent; wind erosion would increase by three percent; sediment yield would increase by seven percent; about 1600 acres of soil would experience an increase in compaction.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section identifies resource commitments associated with Alternative C which are irreversible (incapable of being reversed) and irretrievable (once used, cannot be replaced).

1. Construction of improvements would result in the permanent elimination of 162 acres of vegetation and wildlife habitat, and the permanent change in the soil structure on 183 acres.

2. Erosion would cause the irretrievable loss of soil for the duration of Alternative C. Losses from wind erosion would amount to an additional 0.6 tons per year compared to existing conditions. Sediment yield would increase about 21.3 acre-feet per year.

3. Water use would increase by 79 acre-feet per year over current use.

4. Cultural resources affected by trampling, rubbing or erosion would suffer an irreversible deterioration in condition. Once disturbed, resources are more difficult to recover and properly interpret, causing a data gap. Excavation of resources at construction or salting sites would recover information which is available to current techniques, but would foreclose the opportunity to gather additional information which might be recovered by future improvements in technique.

5. Investments of construction funds and materials for range improvements would represent a permanent commitment of these resources.

ALTERNATIVE D. CHANGE GRAZING SEASON TO OCTOBER-MARCH

Alternative D would implement the proposed action as described in Chapter 1, except that the grazing season would be changed to a 6 month period from October to March to allow cool-season plants to be rested during their growing

SOILS

Erosion. Wind erosion and sediment yield would decrease if Alternative B is implemented, because the decreased utilization of forage would be associated with an increase in the protective effects of vegetation. The wind erosion equation uses productivity as a measure of the protective effects of vegetation. In the case of Alternative B, productivity is not adequate as a measure of ground protection, since the decrease in productivity is actually the result of increased litter, which would help stabilize the soil. As an approximate measure of the actual change in erosion, Alternative B is assumed to have effects which are generally similar in magnitude to the proposed action, but (except for productivity) opposite in direction. Thus the change in erosion would be the same as that predicted for the proposed action, but would be a decrease of two percent rather than an increase. Using the same assumptions, there would be a five percent decrease in sediment yield. Both changes are quantified in Table 8-2.

Compaction. Elimination of grazing would allow soils near existing water facilities to expand gradually due to natural weathering processes. The natural processes would require many years before the soil structure is completely restored. With expansion, the infiltration capacity and seed-survival potential of the soils would improve. The total area which would benefit is approximately 800 acres. Additional acreage in corrals would also benefit. The increase in litter would tend to increase soil organic content and moisture-holding capacity, which would decrease fluctuations in soil microenvironment.

Summary. Wind erosion and sediment yield would decrease by two and five percent respectively under Alternative B. The structure of compacted soils around existing water facilities would gradually be improved over a period of many years, increasing infiltration capacity.

WATER

The decrease in cattle and deer AUMs would cause a net decrease in the consumption of water by animals from 50 to 5 acre-feet per year (see p. 3-26). Total use would decrease from 86 to 41 acre-feet per year.

WILDLIFE

Under Alternative B, management of wildlife on McGregor Range would be the responsibility of DOA. For purposes of a worst-case analysis, it is assumed that DOA's management would be less intensive than present management. It is assumed that wells would not be pumped, and pipelines and troughs would not be maintained. Restrictions on hunter access (poaching) would possibly be less effective. Because of these changes, a decrease in deer populations could occur. Increases in antelope populations would not be expected.

Game animals. Because of reduced water availability (and perhaps increased poaching), Alternative B could lead to reductions in the McGregor Range deer herd. Accurate quantification of the change cannot be made with available data. It is assumed that the population would be one-half the optimum which would result from other alternatives (see Table 8-1). Elimination of competition for forage between cattle and deer might benefit deer somewhat. However, it would also eliminate the benefits of cattle utilization, which causes regrowth, increasing the palatability of the vegetation.

Antelope populations would remain near existing levels. As discussed on p. 3-3, plants of special importance to the antelope diet, such as forbs, do not appear to be adversely affected by present levels of grazing. Elimination of grazing would therefore provide few, if any, benefits toward increasing the antelope herd. Noise-related disturbance of antelope near pumping facilities would be eliminated.

In the 4,400 acres near existing water facilities, vegetation changes and decreased trampling would increase the effective habitat available to game birds and could cause an increase in their abundance. Increases would be offset by the decreased availability of water. Dove and Gambel's quail populations would decrease with fewer watering holes, while scaled quail would not be affected.

Small mammals. Alternative B would be expected to maintain existing populations of rabbits, rodents, and other small mammals. Near existing water facilities, elimination of cattle would increase populations and biomass of herbivorous rodents. Species such as the cotton rat and silky pocket mouse would benefit. Habitat diversity would be decreased, and the total number of mammal species near the facilities could decrease for the Range as a whole. Jackrabbit populations would be expected to decrease, while desert cottontail would expand. It is not possible to quantify these impacts, but they would be small due to the limited acreage involved.

Other animals. Some non-game birds, especially ground-nesting species, would be affected in a manner similar to game birds. Populations might increase slightly near water, but diversity could decrease. Most bird species would be adversely affected by the reduced availability of water. Horned lizards and the Mojave rattlesnake on Otero Mesa could benefit from the reduction in trampling, especially during late spring.

Threatened or endangered species. The peregrine falcon and the regionally endangered or threatened species on the Range could benefit from changes in plant cover, decreased cattle trampling, and, in the case of prairie dogs, decreased competition for food. There is no information available on the occurrence of these species on the Range, and no basis for further defining the potential benefits.

Summary. Alternative B would protect many of the environmental conditions which presently support a diverse wildlife population on McGregor Range, but could lead to reductions in deer numbers. Major changes to wildlife habitat

OTHER IMPACTS

Cover. The 8,850 acres of land near new water would be expected to experience a substantial decrease in canopy cover, and a net decrease in plant density of as much as 50 percent. Elsewhere, cover would not be expected to change. Using the evaluation presented on p. 3-17, the net effect of this alternative would be a 50 percent decrease in cover on 8,850 acres, and little or no change on the remaining 506,150 acres within the Co-use area. In terms of increased exposure of soil, this is equivalent to a one percent decrease in cover over the entire area. As described in Chapter 2, existing cover in the fourteen pastures averages 20.5 percent. A one percent decrease would change the cover in the grazed area to 20.3 percent of the ground surface. This change would not be detectable in any type of rangewide monitoring program.

Vigor. The practice of growing-season rest would allow all key forage species to go through their growth cycle largely undisturbed, thus promoting a high level of vigor. Effects on cool-season species are discussed separately.

Litter; fire. Increased utilization of forage, compared to the existing situation, would reduce litter and standing dead material by as much as 50 percent, with the main effect being observed in the 8,850 acres near new water facilities (see p. 3-18). With less dead material available, the amount of exposed soil would be increased. Also, the amount of fuel for fires would be reduced. This would result in less acreage being burned each year by natural and military-related fires. Information is not available to quantify the change in fire frequency.

Cool-season species. Observations made during the 1979 field studies suggest that cool-season plants would not increase to a significant degree because of the elimination of spring grazing. Most of the cool-season plants which would potentially sustain wildlife populations, such as winterfat, are not important parts of the vegetation community under existing conditions, even in areas where utilization is slight. Grazing does not appear to be a factor affecting species occurrence. Thus, the changes in grazing caused by Alternative D would not result in substantial increases in these species.

The distribution of needlegrass, which is a key cool-season forage species, appears to be controlled by site-specific conditions. The species does not occur in many nongrazed Mesa grasslands, which suggests that it is not a part of the climax community. Indeed, under very light grazing, needlegrass vigor is limited (see p. 3-2). Based on the field observations, elimination of spring grazing would not result in substantial increases in needlegrass. However, the increase in overall utilization would improve needlegrass vigor. Further, the vigor of cool-season plants such as needlegrass would be improved in any areas where the plants are presently heavily grazed near existing water facilities. Even though grazing would remain heavy in such areas, the elimination of spring utilization would cause the cool-season plants to increase somewhat in the near-water areas, where soils are favorable.

SUMMARY

Prediction of impacts from Alternative D is based on relationships between vegetation and grazing management which are described in the literature, or which were observed during the 1979 field study. The most fundamental changes resulting from Alternative D would be a more even distribution of livestock and an increase in the number of cattle and wildlife AUMs. The literature and field observations agree that a more even distribution of animals will generally benefit the vegetation resource. However, under Alternative D such benefits would be offset by a 100 percent increase in the number of cattle on the Range at one time. As a result, existing water facilities would experience no reduction in grazing pressure. Although areawide effects of the management program would not be substantial, there would be major changes in vegetation where new water facilities are constructed. Heavy grazing and trampling would be expected to cause a reduction in canopy cover, a reduction in productivity, and a change in species composition to the point that condition would deteriorate by one class.

Quantified impacts, which generally reflect changes near new water supplies, include the following.

1. Development of improvements would cause the short-term loss of 118 acres of productive vegetation, of which 97 acres would be permanenty lost.

2. Near new water facilities, grazing and trampling would cause the deterioration of range condition over an estimated 8,850 acres, leading to reduced herbage production, ground cover, and vigor, as well as a change in composition toward less palatable species. This acreage would decrease in condition by one class.

3. Over the fourteen pastures, increased utilization would be reflected by a decrease in productivity which would not exceed ten percent, and a decrease in cover which would not exceed one percent.

4. Downward trends would continue on 4,400 acres near existing water facilities.

PHYSICAL SETTING

No impacts on climate, topography or geology would occur.

Air quality. TSP would increase by about four percent in the Co-use area, in proportion to the predicted increase in wind erosion. Air quality standards for TSP would continue to be violated on the Range. Reduced burning would decrease TSP from smoke. Emissions would occur from any new pumps which are not wind-powered. Increased traffic dust and exhaust would result from the traffic on newly developed roads. There would be temporary equipment emissions and dust associated with construction activities.

Noise. Noise from construction equipment, pumps, and traffic would disrupt sensitive wildlife species, such as antelope (see p. 3-21). New impacts would occur on 210 acres affected by proposed construction. Permanent increases in intermittent noise levels would be experienced on 50 of the 210 acres, which would increase the area affected by noise by 25 percent compared to present conditions.

Summary. Alternative D would have minor effects on the physical setting of McGregor Range. TSP from wind erosion would increase by four percent, and emissions and dust would occur from construction, traffic, and fuel combustion. TSP from range fires would decline. Noise which would result from construction activity, pump operation, and traffic would disturb antelope and other wildlife in small, localized areas. Of these impacts, only the temporary effects of construction would be likely to be measurable.

SOILS

Erosion. Wind erosion and sediment yield would increase if this alternative is implemented, because the increased utilization of forage would be associated with a small reduction in the protective effects of vegetation (see p. 3-22). Compared to the proposed action, Alternative D would increase the extent of erosion because of the greater concentrations of animals near existing and new water supplies, and the greater effect of the alternative on cover. Assuming that the difference in erosion would be proportional to the difference in cover, Alternative D would cause wind erosion rates to increase by four percent compared to existing conditions, while sediment yield would increase by ten percent. These changes are quantified in Table 8-2. Both the wind and water erosion estimates reflect the general magnitude of change and are not absolute values.

Compaction. The soil within an area of up to 20 acres around new water facilities would be compacted by cattle trampling (see p. 3-24). The total affected area would amount to about 1,600 acres. The compaction would decrease infiltration rates, especially on clay soils. The reduction in infiltration would cause a reduction in available soil moisture in the root zone, and, where sizeable, would reduce seed-survival rates. In areas which are now lightly utilized, the effects of trampling would be expected to break up soil aggregates and increase infiltration capacity and soil moisture slightly. The reduction in litter would tend to reduce soil organic content and moisture-holding capacity slightly, and allow greater fluctuations in microenvironment. On acres directly affected by construction, earth-moving activity would be expected to alter or destroy existing soil structures. Impacts would be most significant where ripping equipment is used to penetrate caliche and fractured bedrock.

Summary. Increased erosion would result from Alternative D, due to concentrations of animals near new water facilities. Wind erosion would increase by four percent and sediment yield by ten percent, compared to existing conditions. Soil structure would be destroyed at construction sites, and trampling

would cause compaction and related physical changes on about 1,600 acres near new water facilities. Soil moisture and infiltration rates would be reduced and erosion would increase near the new facilities.

WATER

The increase in cattle, deer, and antelope AUMs would cause a net change in water from 50 to 68 acre-feet per year. The amount of surface area in troughs and water storage facilities would increase from 6 to 12 surface acres, increasing evaporation losses from 36 to 72 acre-feet per year (see p. 3-26). Total use would increase from 86 to 140 acre-feet in an average year. The change would be small when compared to the total water resources of the Range. The increase in cattle numbers during a shortened grazing season would require more active management by BLM in order to ensure that all active troughs receive an adequate supply of water. Also, there would be increased use of dirt tanks (compared to the proposed action) because these reservoirs are generally full in fall and winter periods.

WILDLIFE

Game animals. Alternative D would allow optimal deer populations to be reached. The optimal estimates are presented on p. 3-27; population data are given in Table 3-6. Estimates of deer AUMs are presented in Table 3-3. Average deer population in the 14 pastures would change from 3,730 to 5,096, an increase of 1,366 animals. Although forage would be available to support increases in both deer and cattle numbers, some competition for forage would occur, especially in winter when cattle may browse mountain mahogany. In favorable years, the competition would benefit deer. Forage utilization by cattle would cause regrowth, increasing the palatability of the vegetation and effectively increasing the amount of food which deer would preferentially consume. In adverse years, the competition could adversely affect deer. However, the monitoring program outlined in Appendix B would be expected to ensure that excessive competition for browse species is avoided. Near new water facilities, significant changes in cover would occur, and cattle numbers would be increased for prolonged periods. Deer tend to avoid areas where cattle numbers are high. Consequently, areas near new water would no longer be considered as primary deer habitat.

NMDGF estimates optimal antelope densities at 4 per square mile in the Mesa natural unit. Table 3-6 lists the projected antelope populations, by pasture. AUM equivalents are given in Table 3-3. The herd size is projected to increase from 253 to 689 animals. As discussed on p. 3-3, species of special importance to the antelope diet, such as forbs, do not appear to be adversely affected by present levels of grazing. These plants would benefit from spring rest. In most years, benefits to antelope would probably be minimal. However, elimination of cattle-antelope competition for forage during spring would be beneficial to antelope during a drought period. As described for deer, such impacts can also be avoided by the use of monitoring and adjustments of stocking levels.

In the 8,850 acres near new water facilities, habitat changes and increased trampling would reduce the effective habitat available to game birds, and would cause a decrease in species abundance. Reductions would be offset to some extent because of the increased availability of water. Dove and Gambel's quail popu- lations would increase with more watering holes, while scaled quail would prob- ably not be affected. Overall, the anticipated change would be expected to be small, as substantial unaltered habitat would remain throughout the Range.

Small mammals. Alternative D would be expected to maintain the existing small mammal populations, except for changes which would occur near new water facilities, where habitat changes would reduce populations and biomass of herbivorous rodents. These impacts would be mitigated by the elimination of spring grazing. The new water would also enhance the habitat for some types of wildlife by creating a more diverse environment, and by causing some changes in the species composition of the plant cover (reflected by the deterioration in range condition in these areas). The total number of mammal species near the facilities would increase for the Range as a whole. Jackrabbit populations would be expected to increase, while desert cottontail would decline.

Other animals. Construction activities would permanently destroy small areas of habitat. Temporary displacement of most species would occur near sites of active construction. New fences (such as at corrals) would provide perch sites for birds and lizards. Perches at new water facilities would have the same benefit. Populations of some non-game birds, especially ground-nesting species, would decline slightly near new water, while increasing near existing supplies. Because of plant composition changes near the new water, overall bird diversity in these areas would increase. Seasonal use of the area by waterfowl may increase slightly. Most bird species would benefit from the additional availability of water. The vegetation changes would have minimal effects on most reptiles, as no grazing would occur in the summer months. Species such as the horned lizard and Mojave rattlesnake on Otero Mesa would benefit from reduced trampling, especially during late spring. It is not possible to quantify these impacts with existing data. Road construction would improve access, possibly opening areas to human disturbance, poaching, and habitat destruction. The two large colonies of fringed myotis would continue to be vulnerable to vandalism and possible com- plete destruction during the pupping season.

Threatened or endangered species. Effects on threatened or endangered species would be limited to a reduction in potential habitat caused by changes in range condition near new water facilities. This may have a minor effect on the peregrine falcon and on regionally threatened or endangered species.

Summary. Alternative D would generally protect or enhance the environmental conditions which presently support a diverse wildlife population on McGregor Range. Forage sufficient for wildlife needs would remain available even though livestock grazing would increase. Major changes to wildlife habitat would be limited to areas near proposed improvements, especially water facilities, where changes in the vegetation would benefit some species and have adverse effects on others.

Increased availability of water and more intensive management would allow deer and antelope populations to increase. More intense cattle grazing would not impair the habitat of either of these large herbivores. Optimal populations of 5,096 deer (3,597 AUMs) and 689 antelope (435 AUMs) would be reached, although factors other than food and water could play a role in limiting growth of the herds. Populations of other wildlife species would generally be maintained.

Introduction of water facilities would benefit species which can utilize the water or associated perch sites, or which are favored by decreases in cover and a greater diversity in vegetation. Animal species likely to be favored by new water facilities would include jackrabbits and waterfowl. The change in cover and vegetation would adversely impact other species, including scaled quail, cottontails, ground-nesting birds, horned lizards, and the Mohave rattlesnake.

CULTURAL RESOURCES

Increases in livestock numbers on the Range would increase rates of deterioration of cultural resources, especially near proposed new water facilities and in proposed corrals (see p. 3-32). Impacts would be greatest at sites which contain ceramic remains at the ground surface, or which have structures with a floor and faint traces of adobe walls. The impacts would be especially significant in Pastures 1 and 3, which have a relatively high density of known habitation sites. Because of the increase in livestock numbers, Alternative D would have more adverse effects on cultural resources than other alternatives.

Impacts associated with the proposed action (p. 3-33) would also occur with Alternative D. These include: minor damage to historic structures due to cattle rubbing; vandalism associated with access along new roads; possible increased damage by higher rates of wind and water erosion. All of the impacts discussed above would result in a reduction of information available for the study of human civilization in the past, but all would be minimized by locating new facilities away from particularly valuable sites.

VISUAL RESOURCES

After implementation of Alternative D, 450 square miles would remain in VRM Class III and 354.7 square miles would remain in VRM Class IV.

WILDERNESS

Application of Section 603(c) of FLPMA would prevent any adverse impacts on potential wilderness areas (see p. 2-40).

RECREATION

Hunting potentials for game birds would remain unchanged compared to existing conditions. Big-game hunting opportunities are assumed to increase in direct proportion to increases in deer and antelope populations (see p. 3-34). To the degree that cultural resources are disturbed or destroyed, the potential for the eventual development of recreation-related cultural and natural history resource sites would be adversely affected. In the context of the existing and potential recreational use of the Range, these impacts would be minor.

LAND USE

Alternative D does not involve a basic change in the amount of land which would be used for different purposes. The proposed action involves no components which would conflict with continued use of McGregor Range for military purposes. The expanded management program would require more intensive involvement by operators, as described on p. 3-35. Increased grazing would lead to less litter, and there would likely be fewer acres of land lost to fires resulting from missile crashes and other defense ordnance.

In the Canyonlands and Mountain Foothills natural units, improvements would be placed in areas which are presently rated as potentially suitable for grazing (see p. 3-35). Approximately 13,250 acres would change from potentially suitable to suitable. For the grazed area (271,000 acres), this would increase the total acreage rated as suitable from 216,400 to 227,650 acres.

TRANSPORTATION

The proposed action would provide 46.75 miles access to new water facilities, which would increase access to sectors of the fourteen pastures which are presently difficult to reach using conventional vehicles. The increase represents an addition of 15 percent to the existing road network. Additional cattle trucks and road construction equipment would increase traffic by a few vehicles for a few days of the year.

SOCIO-ECONOMIC CONDITIONS

Alternative D would increase the income which BLM obtains through grazing fees, from $233,000 per year to $315,000 per year, or about $82,000 per year. This represents about 0.13 percent of the total personal income of Otero County. Benefits to lessees would increase from $994,800 per year to $1,493,700 per year, a gain of $498,900 or 50 percent. The increased benefits would result from increases in AUMs and calf crops. The total benefits from the alternative represent 0.3 percent of the total value of New Mexico's beef industry and 14 percent of the industry value in Otero County. However, most of the income would continue to be received outside Otero County and earned outside New Mexico. Lessees would spend less on operations, because of the

shortened season. However, operators could be adversely affected by removal of animals just after calving. Any operator who needs land for spring grazing would probably cease to utilize McGregor Range.

SUMMARY OF IMPACTS, CHANGES IN PRODUCTIVITY, AND RESOURCE COMMITMENTS

This section provides information on Alternative D which is similar to the information provided about the proposed action in Chapters 4, 5, 6, and 7.

MITIGATION MEASURES

All proposed mitigation is described in Chapter 1 as part of the design features of the alternative (Table 1-1).

UNAVOIDABLE ADVERSE IMPACTS

The most significant impacts listed above, which are adverse and which cannot be mitigated, are summarized in this section.

Vegetation. A downward change of one condition class is projected to occur on 8,850 acres within the existing fourteen pastures. Under a worst-case analysis, increased utilization of forage would cause a reduction in herbage yields of up to ten percent rangewide, from 560 to 502 pounds per acre per year. The effects would be greatest in those areas which presently experience light or slight utilization, and which would be near a new water supply. In the near-water areas, canopy cover would decrease, basal cover would increase, and total plant cover would decrease as much as 50 percent. The rangewide impact of this localized change would be a one percent reduction in cover. Construction of improvements would cause disturbance or removal of vegetation on 118 acres, of which 97 acres would be affected over the long term. The remainder (pipeline routes) would experience short-term impacts.

Physical setting. Effects of Alternative D on the physical setting of McGregor Range would generally be too small to measure. TSP would increase by an estimated four percent due to increased wind erosion. Construction would cause localized temporary emissions of air pollutants and an increase in noise levels to 65 to 70 decibels (with peaks to 80 decibels). The noise would adversely affect as much as 210 acres of wildlife habitat.

Soils. Wind erosion would increase by about four percent as a result of the reduction in soil protection caused by reduction in litter and cover. Sediment yield would increase by about ten percent. Construction of improvements would disrupt soil structure on 118 acres. Cattle trampling would increase soil compaction on a total of 1,600 acres. Compaction would result in decreased infiltration capacity.

Water. Water consumption by cattle and wildlife would increase from 50 to 68 acre-feet per year. Evaporation from stock and wildlife water supplies would increase from 36 to 72 acre-feet per year.

Wildlife. The alternative would have no substantial adverse effects on the overall wildlife resources on McGregor Range. Near new water sources, increased use of forage by cattle and resulting decreases in forage production and canopy cover would reduce populations and biomass of herbivorous rodents, cottontail rabbits, and some birds and predator species. Horned lizards and the Mojave rattlesnake would benefit from reduced trampling. Elimination of spring grazing would benefit antelope populations slightly, especially in years of limited forage production. Temporary displacement of deer, antelope, game birds, and small vertebrates would occur near active construction sites. Construction would permanently destroy 97 acres of wildlife habitat.

Cultural resources. Mitigation measures would be of some value in minimizing the effect of Alternative D on cultural resources. However, resources would be damaged by increased trampling and rubbing by cattle, especially in areas near new water facilities.

Other resources. No adverse impacts have been identified which would substantially alter visual resources, wilderness, recreation, land use, transportation, or socio-economic conditions.

RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The alternative involves a tradeoff between: 1) increased benefits from the harvest of vegetation by cattle, deer, and antelope, accompanied by stabilized range condition in presently overgrazed areas; and 2) decreased production of vegetation, associated with substantial adverse environmental changes near new water facilities. The tradeoff would bring forage production and utilization into a balance, unlike the existing situation where productivity is high, but utilization is light. The balanced production and harvest would provide a sustained yield of vegetation at a level which would support 37 percent more herbivore grazing than now occurs.

All significant benefits and impacts from Alternative D relate to the long-term use of the Range over a 20-year period or beyond. Benefits from the project include: conversion of 13,250 acres from potentially suitable to suitable for grazing; a more even distribution of livestock within the existing pastures; an increase in forage utilization; an increase in plant vigor in areas now subject to light or slight utilization; protection of forage and provision of water for large game animals (deer, antelope); an increase in livestock numbers and AUMs; and an increase in income within the private cattle industry of about $498,900 per year.

The improved distribution of animals and the increase in forage harvest would cause the following losses in productivity: 97 acres of grazing land and wildlife habitat would be permanently lost; range condition would decrease by one class on about 8,850 acres; forage production would decrease by no more than ten percent; plant cover would decrease by one percent; wind erosion would increase by four percent; sediment yield would increase by ten percent; about 1,600 acres of soil would experience an increase in compaction.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section identifies resource commitments associated with Alternative D which are irreversible (incapable of being reversed) and irretrievable (once used, cannot be replaced).

1. Construction of improvements would result in the permanent elimination of 97 acres of vegetation and wildlife habitat, and a permanent change in the soil structure on 118 acres.

2. Erosion would cause the irretrievable loss of soil for the duration of Alternative D. Losses from wind erosion would amount to an additional 0.9 tons per year compared to existing conditions. Sediment yield would increase about 30.4 acre-feet per year.

3. Water use would increase by 54 acre-feet per year over current use.

4. Cultural resources affected by trampling, rubbing or erosion would suffer an irreversible deterioration in condition. Once disturbed, resources are more difficult to recover and interpret properly, causing a data gap. Excavation of resources at construction or salting sites would recover information which is available to current techniques, but would foreclose the opportunity to gather additional information which might be recovered by future improvements in technique.

5. Investments of construction funds and materials for range improvements would represent a permanent commitment of these resouces.

ALTERNATIVE E. CHANGE GRAZING SEASON TO OCTOBER - MARCH AND REDUCE GRAZING

Under Alternative E the proposed action would be implemented as described in Chapter 1, except that the grazing season would be changed to a 6-month period from October to March. As discussed for Alternative D, the concentration of grazing in a 6-month period, and an increase in utilization, would double cattle numbers compared to existing conditions. To reduce the effect, Alternative E would provide for the sale of two-thirds, of the AUMs which would result from the proposed action, or 38,153 AUMs per year. This is 7 percent less than the present level of 42,060 AUMs per year. Deer and antelope AUMs would increase to 4,032 per year. This would bring the total AUMs (exclusive of use by other wildlife) to 42,185 per year. Figure 8-1e illustrates the AUMs which would be utilized under this alternative. Livestock numbers would be similar to those resulting from the proposed action. Because AUMs would decrease compared to the proposed action, annual income to BLM would be reduced. It would take 18 to 20 years to fund the construction of all proposed improvements. However, the reduction in AUMs would be immediate.

VEGETATION

TYPES OF IMPACTS

Alternative E would alter vegetation through construction of improvements, development of new water facilities, management to reduce utilization of key forage species, and elimination of spring grazing. Livestock distribution would be improved (see p. 3-10). Compared to existing levels, grazing would be increased in Pastures 3, 4, 5, 7, and 8, and decreased elsewhere.

UTILIZATION

Alternative E would allow livestock to utilize virtually all of the fourteen pastures, including areas now lightly grazed or nongrazed (see p. 3-12). Overall utilization in the fourteen pastures would remain light. Pastures with upland areas (Pastures 3, 4, 5, 7, and 8) would experience a small increase in utilization, while other pastures would be utilized less than at present. Assuming that existing utilization averages 34 percent (p. 3-12), and that the change in utilization would be proportional to the seven percent decrease in AUMs, utilization would change to about 32 percent. This is effectively no change in utilization when compared to the existing situation.

PRODUCTIVITY

Direct effects of construction. Construction of improvements would cause disturbance or removal of vegetation on 118 acres (Table 8-1). The acreage affected by individual types of improvements is listed in Appendix A (Table A-1). The location of the affected sites is shown on Figure 1-4. Pipeline construction would impact 21 acres which would be covered by weeds in the growing season after construction and would gradually progress toward climax vegetation. Consequently, no significant change in long-term production would occur. The remaining 97 acres would be modified by improvements or would undergo continuing disturbance by concentrations of animals, vehicle traffic or periodic inundation by water, and would no longer be available to support livestock or wildlife.

Effect of decreased AUMs. Since the change in utilization would be small, the change in productivity would also be small. Some decreases would occur near new water facilities, due to reduction in litter production, increased trampling, and associated changes in the soil microclimate. However, improved production near existing water facilities would offset these changes. For practical purposes, net productivity would be essentially unchanged by Alternative E. Herbage yields within the fourteen pastures would remain at about 560 pounds per acre.

CONDITION AND TREND

Existing water facilities. Poor condition range near existing water facilities would benefit from reduced grazing pressure (see p. 3-15). Downward trends on 4,400 acres would be expected to slow, and existing deterioration in

forage production, cover, and vigor would slow. Because AUMs would decrease, this alternative would have more benefits near water than the proposed action. It is possible that a reversal toward an upward trend would occur.

New water facilities. Near new troughs, land which is now lightly grazed would be subject to heavy forage utilization and trampling (see p. 3-16). The change in condition class at new troughs would be expected to be seven percent less than the lower range of the impact which is now observed (in proportion to the projected seven percent decrease in utilization). The change would be one condition class, and would occur over a 23-acre area per facility (93 acres in the upland units). On the affected acreage, forage utilization and trampling would be expected to cause impacts similar to those observed near existing water: reduced forage production, increased bare ground, a decline in plant vigor, and an increase in plants with limited forage value. The downward trend, resulting in a change of one condition class, would impact a total of 4,115 acres. Most of the impact would occur in Pastures 3, 4, and 5.

Rangewide. The decreased number of AUMs would not be expected to cause any change in condition classification away from water supplies (see p. 3-16).

POISONOUS PLANTS

Poisonous species would be expected to increase near new water facilities, especially in the Bolson.

THREATENED OR ENDANGERED PLANTS

The Kuenzler hedgehog cactus, an endangered species, would not be affected by Alternative E, since it is a hardy species which can survive in areas of light to moderate grazing.

OTHER IMPACTS

Cover. The 4,115 acres of land near new water would experience a substantial decrease in canopy cover, and a net decrease in plant density of as much as 50 percent (see p. 3-17). On areas near existing water facilities, reduced grazing should allow canopy cover to increase somewhat. Since overall utilization would decrease, it is expected that the improvement near existing water would balance the decreases in cover near new water facilities. Thus net cover would remain at 20.5 percent.

Vigor. The practice of growing-season rest would allow all key forage species to go through their growth cycle largely undisturbed, thus promoting a high level of vigor. The vigor of cool-season plants such as needlegrass would be improved in any areas where the plants are presently heavily grazed, such as near existing water facilities. Even though grazing would continue in these areas, the elimination of spring utilization would cause the cool-season plants to improve somewhat in the near-water areas, where soils are favorable.

Litter; fire. Alternative E would have little effect on the amount of litter and standing dead material observed on the Range. There would be little change in the availability of fuel for fires.

Cool-season species. Observations made during the 1979 field studies suggest that cool-season plants would not increase to a significant degree because of the elimination of spring grazing. Most of the cool-season plants which would potentially sustain wildlife populations, such as winterfat, are not important parts of the vegetation community under existing conditions, even in areas where utilization is slight. Grazing does not appear to be a factor affecting species occurrence. Thus, the changes in grazing caused by Alternative E would not result in substantial increases in these species.

The distribution of needlegrass, which is a key forage species, appears to be controlled by site-specific conditions. The species does not occur in many nongrazed Mesa grasslands, which suggests that it is not a part of the climax community. Indeed, under slight grazing, needlegrass vigor is limited (see p. 3-3). Based on the field observations, elimination of spring grazing would not result in substantial increases in needlegrass. However, the increase in overall utilization would improve needlegrass vigor.

SUMMARY

Prediction of impacts from Alternative E is based on relationships between vegetation and grazing management which are described in the literature, or which were observed during the 1979 field study. Utilization would be maintained at levels slightly below those now occurring. Concentrations of animals near water would be less under this alternative than under all other alternatives except B. The literature and field observations agree that a more even distribution of animals would generally benefit the vegetation resource. Even so, concentrations of animals near new water facilities would be expected to cause a reduction in canopy cover, a reduction in productivity, and a change in species composition to the point that condition would deteriorate by one class. Near existing water facilities, the reduction of grazing pressure could improve conditions. The net effect of Alternative E would be no change in rangewide productivity, cover or condition. However, for purposes of a worst-case analysis, it is projected that condition would decrease by one class near the new water, while near existing facilities the reversal of downward trend would not cause an improvement in condition.

Quantified impacts include the following.

1. Development of improvements would cause the short-term loss of 118 acres of productive vegetation, of which 97 acres would be permanently lost.

2. Near new water facilities, grazing and trampling would cause the deterioration of range condition over an estimated 4,115 acres, leading to reduced herbage production, ground cover, and vigor, as well as a change in composition toward less palatable species. This acreage would decrease in condition by one class.

3. The downward trend which occurs on 4,400 acres near existing water would probably be stopped and possibly reversed.

PHYSICAL SETTING

No impacts on climate, topography or geology would occur.

Air quality. Rates of wind erosion would be unchanged from existing conditions, and TSP related to wind-borne dust would not be affected. Air quality standards for TSP would continue to be violated on the Range. Emissions would occur from any new pumps which are not wind-powered. Increased traffic dust and exhaust would result from the traffic on newly developed roads. There would be temporary equipment emissions and dust associated with construction activities. Measurable changes from these effects would probably be limited to the temporary effects of construction.

Noise. Noise from construction equipment, pumps and traffic would disrupt sensitive wildlife species, such as antelope (see p. 3-21). New impacts would occur on 210 acres affected by proposed construction. Permanent increases in intermittent noise levels would be experienced on 50 of the 210 acres, which would increase the area affected by noise by 25 percent compared to present conditions.

Summary. Emission dust and noise would occur from construction activity, pump operation, and traffic would disturb antelope and other wildlife in small localized areas.

SOILS

Erosion. Alternative E would result in little if any change in productivity or cover. Consequently, existing rates of wind and water erosion would be unchanged. Local increases in erosion near new water facilities would be offset by decreases near the existing water supplies.

Compaction. The soil within an area of up to 9 acres around new water facilities would be compacted by cattle trampling (see p. 3-24). The total affected area would amount to about 720 acres. The compaction would decrease infiltration rates, especially on clay soils. The reduction in infiltration would cause a reduction in available soil moisture in the root zone and, where sizeable, would reduce seed survival rates.

On acres directly affected by construction, earth-moving activity would be expected to alter or destroy existing soil structures. Impacts would be most significant where ripping equipment is used to penetrate caliche and fractured bedrock.

Summary. Alternative E is expected to have little effect on soil erosion. Soil structure would be destroyed at construction sites, and trampling would cause compaction and related physical changes on about 720 acres near new water

facilities. Soil moisture and infiltration rates would be reduced and erosion would increase near the new facilities, while opposite effects would be observed in areas near existing water supplies.

WATER

The decrease in cattle AUMs and increase in deer and antelope AUMs would cause a net decrease in water consumption from 50 to 47 acre-feet per year (see p. 3-26). The amount of surface area in troughs and water storage facilities would increase from 6 to 12 acres, increasing evaporation losses from 36 to about 72 acre-feet per year. Total use would increase from 86 to 119 acre-feet in an average year. The change would be small when compared to the total water resources of the Range. The increase in cattle numbers during a shortened grazing season would require more intensive management by BLM in order to ensure that all active troughs receive an adequate supply of water. Also, there would be increased use of dirt tanks because these reservoirs are generally full in fall and winter periods.

WILDLIFE

Game animals. Alternative E would allow optimal deer populations to be reached. The optimal estimates are presented on p. 3-27; population data are given in Table 3-6. Estimates of deer AUMs are presented in Table 3-3. Average deer population in the fourteen pastures would change from 3,730 to 5,096, an increase of 1,366 animals. Although forage would be available to support increases in both deer and cattle numbers, some competition for forage would occur, especially in winter when cattle may browse mountain mahogany. In favorable years, the competition would benefit deer. Forage utilization by cattle would cause regrowth, increasing the palatability of the vegetation, and effectively increasing the amount of food which deer would preferentially consume. In adverse years, the competition could adversely affect deer. However, the monitoring program outlined in Appendix B would be expected to ensure that excessive competition for browse species is avoided. Near new water facilities, significant changes in cover would occur, and cattle numbers would be increased for prolonged periods. Deer tend to avoid areas where cattle numbers are high. Consequently, areas near new water would no longer be considered as primary deer habitat.

NMDGF estimates optimal antelope densities at 4 per square mile in the Mesa natural unit. Table 3-6 lists the projected antelope populations, by pasture. AUM equivalents are given in Table 3-3. The herd size is projected to increase from 253 to 689 animals. As discussed on p. 3-3, species of special importance to the antelope diet, such as forbs, do not appear to be adversely affected by present levels of grazing. These plants would benefit from spring rest. In most years, benefits to antelope would probably be minimal (see p. 8-44). However, elimination of cattle-antelope competition for forage during spring would be beneficial to antelope during a drought period. As described for deer, such impacts can also be avoided by the use of monitoring, and adjustments of stocking levels.

In the 4,115 acres near new water facilities, habitat changes and increased trampling would reduce the effective habitat available to game bird species, and would cause a decrease in species abundance. Reductions would be offset to some extent because of the increased availability of water. Dove and Gambel's quail populations would increase with more watering holes, while scaled quail would probably not be affected. Overall, the anticipated change would be expected to be small, as substantial unaltered habitat would remain throughout the Range.

Small mammals. Alternative E would be expected to maintain existing populations, except for changes which would occur near new water facilities, where increased cattle use would reduce populations and biomass of herbivorous rodents. These effects would be mitigated by elimination of spring grazing, and the reduction in AUMs. The new water would also enhance the habitat for some types of wildlife, by creating a more diverse environment, and by causing some changes in the species composition of the plant cover (reflected by the deterioration in range condition in these areas). The total number of mammal species near new facilities would increase for the Range as a whole. Jackrabbit populations would be expected to increase, while desert cottontail would decline. It is not possible to quantify these impacts, but they would be small due to the limited acreage involved.

Other animals. Construction activities would permanently destroy small areas of habitat. Temporary displacement of most species would occur near sites of active construction. New fences (such as at corrals) would provide perch sites for birds and lizards. Perches at new water facilities would have the same benefit. Population of some non-game birds, especially ground-nesting species, would decline slightly near new water and increase near existing supplies. Overall bird species diversity would decrease. Seasonal use of the area by waterfowl may increase slightly. Most bird species would benefit from the additional availability of water. The vegetation changes would have minimal effects on most reptiles so long as no grazing occurs in the summer months. Species such as the horned lizard and Mojave rattlesnake on Otero Mesa would benefit from decreased trampling during late spring. It is not possible to quantify these impacts with existing data. Road construction would improve access, possibly opening areas to human disturbance, poaching, and habitat destruction. The two large colonies of fringed myotis would continue to be especially vulnerable to vandalism and possible complete destruction during the pupping season.

Threatened or endangered species. Effects on threatened or endangered species would be limited to a reduction in potential habitat caused by changes in range condition near new water facilities. This may have a minor effect on the peregrine falcon and on regionally threatened or endangered species.

Summary. Alternative E would generally protect or enhance the environmental conditions which presently support a diverse wildlife population on McGregor Range. Forage sufficient for wildlife needs would remain available even though livestock grazing would increase. Major changes to wildlife habitat would be limited to areas near proposed improvements, especially water

facilities, where changes in the vegetation would benefit some species and have adverse effects on others.

Increased availability of water and more intensive management would allow deer and antelope populations to increase. Cattle grazing would not impair the habitat of either of these large herbivores. Optimal populations of 5,096 deer (3,597 AUMs) and 689 antelope (435 AUMs) would be reached, although factors other than food and water would play a role in limiting growth of the herds. Populations of other wildlife species would generally be maintained.

Introduction of water facilities would benefit species which can utilize the water or associated perch sites, or which are favored by decreases in cover and a greater diversity in vegetation. Animal species likely to be favored by new water facilities would include jackrabbits and waterfowl. The change in cover and vegetation would adversely impact other species, including scaled quail, cottontails, ground-nesting birds, horned lizards, and the Mohave rattlesnake.

CULTURAL RESOURCES

Impacts from Alternative E would be similar to, and slightly less than those from the proposed action (see p. 3-32). Increases in livestock numbers on the Range would increase rates of deterioration of cultural resources, especially near proposed new water facilities and in proposed corrals (see p. 3-32). Impacts would be greatest at sites which contain ceramic remains at the ground surface, or which have structures with a floor and faint traces of adobe walls. The impacts would be especially significant in Pastures 1 and 3, which have a relatively high density of known habitation sites.

Impacts associated with the proposed action (p. 3-33) would also occur with Alternative E. These include: minor damage to historic structures due to cattle rubbing; vandalism associated with access along new roads; possible increased damage by higher rates of wind and water erosion. All of the impacts discussed above would result in a reduction of information available for the study of human civilization in the past, but all would be minimized by locating new facilities away from particularly valuable sites.

VISUAL RESOURCES

After implementation of Alternative E, 450 square miles would remain in VRM Class III and 354.7 square miles would remain in VRM Class IV.

WILDERNESS

Application of Section 603(c) of FLPMA would prevent any adverse impacts on potential wilderness areas (see p. 2-40).

RECREATION

Hunting potentials for game birds would remain unchanged. Big-game hunting opportunities are assumed to increase in direct proportion to increases in deer and antelope populations (see p. 3-34). To the degree that cultural resources are disturbed or destroyed, the potential for the eventual development of recreation-related cultural and natural history resource sites would be adversely affected. In the context of the existing and potential recreational use of the Range, these impacts would be minor.

LAND USE

Alternative E does not involve a basic change in the amount of land which would be used for different purposes. The proposed action involves no components which would conflict with continued use of McGregor Range for military purposes. The expanded management program would require more intensive involvement by operators, as described on p. 3-35. Increased grazing would lead to less litter, and there would likely be fewer acres of land lost to fires resulting from missile crashes and other defense ordnance. Approximately 13,250 acres would change from potentially suitable to suitable (see p. 3-35). For the grazed area (271,000 acres), this would increase the total acreage rated as suitable from 229,650 to 242,900.

TRANSPORTATION

Alternative E would involve 46.75 miles of access roads associated with water facilities, which would increase access to sectors of the fourteen pastures presently difficult to reach using conventional vehicles. The increase represents an addition of 15 percent to the existing road network. Additional cattle trucks and road construction equipment would increase traffic by a few vehicles for a few days of the year. This increase would have a negligible effect on the daily vehicle counts listed in Chapter 2.

SOCIO-ECONOMIC CONDITIONS

Alternative E would decrease the income which BLM obtains from grazing fees. The expected decrease would be from $233,000 per year to $210,000 per year, or about $23,000 per year. This represents about 0.09 percent of the total personal income of Otero County. Benefits to lessees would increase from $994,800 per year to $995,800 per year, which is effectively no change. The total benefits from the alternative represent 0.2 percent of the total value of New Mexico's beef industry and 10 percent of the industry value in Otero County. However, most of the income would continue to be received outside Otero County and earned outside New Mexico. Lessees would spend less on operations, because of the shortened season. However, operators could be adversely affected by removal of animals just after calving. Any operator who needs land for spring grazing would probably cease to utilize McGregor Range.

SUMMARY OF IMPACTS, CHANGES IN PRODUCTIVITY, AND RESOURCE COMMITMENTS

This section provides information on Alternative E which is similar to the information provided about the proposed action in Chapters 4, 5, 6 and 7.

MITIGATION MEASURES

All proposed mitigation is described in Chapter 1 as part of the design features of the proposed action (Table 1-1).

UNAVOIDABLE ADVERSE IMPACTS

The most significant impacts listed above, which are adverse and which cannot be mitigated, are summarized in this section.

Vegetation. A downward change of one condition class is projected to occur on 4,115 acres within the existing fourteen pastures. In the near-water areas, canopy cover would decrease, basal cover would increase, and total plant cover would decrease as much as 50 percent. Construction of improvements would cause disturbance or removal of vegetation on 118 acres, of which 97 acres would be affected over the long term. The remainder (pipeline routes) would experience short-term impacts.

Physical setting. Effects of Alternative E on the physical setting of McGregor Range would generally be too small to measure. TSP would not change. Construction would cause localized temporary emissions of air pollutants and an increase in noise levels to 65 to 70 decibels (with peaks to 80 decibels). The noise would adversely affect as much as 210 acres of wildlife habitat.

Soils. Construction of improvements would disrupt soil structure on 118 acres. Cattle trampling would increase soil compaction on a total of 720 acres. Compaction would result in decreased infiltration capacity.

Water. Water consumption by cattle and wildlife would decrease from 50 to 47 acre-feet per year. Evaporation from stock and wildlife water supplies would increase from 36 to 72 acre-feet per year.

Wildlife. The alternative would have no substantial adverse effects on the overall wildlife resources on McGregor Range. Near new water sources, increased use of forage by cattle and resulting decreases in forage production and canopy cover would reduce populations and biomass of herbivorous rodents, cottontail rabbits, and some birds and predator species. Horned lizards and the Mojave rattlesnake would benefit from decreased trampling in spring. Temporary displacement of deer, antelope, game birds, and small vertebrates would occur near active construction sites. Construction would permanently destroy 97 acres of wildlife habitat.

Cultural resources. Mitigation measures would minimize effects of Alternative E on cultural resources. However, resources would be affected by increased trampling and rubbing by cattle, especially in areas near new water facilities.

Socio-economic conditions. Benefits to the cattle industry would not change significantly compared to existing conditions.

Other resources. No adverse impacts have been identified which would substantially alter visual resources, wilderness, recreation, land use, or transportation.

RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

All significant benefits and impacts from Alternative E relate to the long-term use of the Range over a 20-year period or beyond. Benefits from the project include: conversion of 13,250 acres from potentially suitable to suitable for grazing; a more even distribution of livestock within the existing pastures; stabilization of a downward trend in condition near existing water supplies; an increase in plant vigor in areas now subject to light or slight utilization; protection of forage and provision of water for large game animals (deer, antelope). Alternative E would forego opportunties to increase the harvest of the long-term production of vegetation on McGregor Range and potential benefits to the livestock industry.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section identifies resource commitments associated with Alternative E which are irreversible (incapable of being reversed) and irretrievable (once used, cannot be replaced).

1. Construction of improvements would result in the permanent elimination of 97 acres of vegetation and wildlife habitat, and the permanent change in the soil structure on 118 acres.

2. Water use would increased by 33 acre-feet per year.

3. Cultural resources affected by trampling, rubbing or erosion would suffer an irreversible deterioration in condition. Once disturbed, resources are more difficult to recover and interpret properly, causing a data gap. Excavation of resources at construction or salting sites would recover information which is available to current techniques, but would foreclose the opportunity to gather additional information which might be recovered by future improvements in technique.

4. Investments of construction funds and materials for range improvements would represent a permanent commitment of these resources.

ALTERNATIVE F: REDUCE GRAZING IN PASTURES 3, 4, AND 5

AND PROVIDE FOR SUMMER GRAZING

Alternative F would be similar to the proposed action, with two major changes. First, livestock grazing in prime deer habitat areas would be gradu-

ally reduced as AUMs become available elsewhere within the existing pastures. Eventually, construction of improvements would allow enough grazing on Otero Mesa and other areas to permit elimination of grazing in the upland portion of Pasture 3, and in all of Pastures 4 and 5. Second, summer grazing would occur on some units to enable utilization of tobosa, sacaton, and other species which normally are not a primary forage resource, and in so doing, would reduce utilization of key forage species such as black grama.

Table 8-1 lists the improvements which would be constructed. None of the improvements listed in Appendix A for Pastures 4 and 5 would be constructed. Of the improvements listed for Pasture 3, 2.5 miles of pipeline, two wells, four water storage facilities, six troughs, one corral, and 6.5 miles of road would not be constructed. The number of cattle AUMs offered for sale would be 49,335, which is 86 percent of the AUMs which would be offered if the proposed action is im- plemented. AUMs in the existing pastures would be as described in Table 3-3, except that there would be no livestock in Pastures 4 and 5, and there would be 1,876 livestock AUMs in Pasture 3. Deer and antelope AUMs would equal 4,032 per year. This would bring the total AUMs (exclusive of use by other wildlife) to 53,367 per year. Figure 8-1f illustrates the AUMs which would be utilized under this alternative. Both income and construction costs would be reduced compared to the proposed action. Implementation of the construction program would require about 12 years.

VEGETATION

TYPES OF IMPACTS

Alternative F would alter vegetation through construction of improvements, development of new water facilities, management to allow greater utilization of key forage species, and elimination of most upland grazing. Grazing would potentially occur in the growth season of most key forage species. The improvements would benefit distribution of livestock (see p. 3-10).

UTILIZATION

Alternative F would increase utilization throughout the presently grazed area, except in the Mountain Foothills and Canyonlands natural units, where forage use would be markedly decreased. Where grazing continues, utilization would change from light (overall) to moderate (see p. 3-12). Acres in different utilization classes would be as described in Table 3-3, except for Pastures 3, 4, and 5. In Pastures 4 and 5, all acres would be rated in the slight utilization category, since the only forage use would be by wildlife. About one-third of Pasture 3 would be slightly grazed, so that the overall utilization of that pasture would be light.

Under an alternative which involves October-June grazing, such as the proposed action, tobosa and alkali sacaton receive little or no utilization. These species are relatively palatable during summer, and would receive slight utilization under an alternative which involves summer grazing. Based on the

judgement of the EIS team, these species would not receive greater (light) utilization unless overall grazing pressure were heavy. If such heavy grazing were to occur on a rangewide basis, it is likely that there would be overgrazing of grama grasses during their critical growth period. Monitoring of forage use, as described in Appendix B, would lead to actions to eliminate such overgrazing. Either stocking levels would be decreased, or adjustments to the grazing season would be made. In either case, utilization of tobosa and sacaton would be held to a slight level, and the effects of Alternative F on vegetation would be similar to those of the proposed action.

PRODUCTIVITY

Direct effects of construction. Construction of improvements would cause disturbance or removal of vegetation on 89 acres. Pipeline construction would impact approximately 17 acres. The sites would be covered by weeds in the growing season after construction and would gradually progress toward climax vegetation. Consequently, no significant change in long-term production would occur. The remaining 72 acres would be modified by improvements or would undergo continuing disturbance by concentrations of animals, vehicle traffic or periodic inundation by water and would no longer be available to support livestock or wildlife.

Effects of changes in AUMs. The projected increase in utilization would be expected to reduce productivity within the area which continues to be actively grazed (see p. 3-15). Reduced productivity would also occur in the area where livestock grazing is no longer allowed. The decrease in productivity on McGregor would not be expected to exceed a value of ten percent in the existing pastures, and would be largely due to grazing and trampling near new water facilities, and to stagnation in the upland pastures.

CONDITION AND TREND

Existing water facilities. Reduced forage utilization and trampling in the poor condition range near existing water facilities would benefit 4,400 acres which currently have a downward trend in range condition. The downward trend would be expected to slow, and existing deterioration in forage production, cover, and vigor would slow. A reversal toward an upward trend would not be expected in lowland areas, as grazing pressure would remain significant. However, the elimination of livestock grazing in upland areas would probably cause a reversal of trend in parts of Pasture 3, and in Pastures 4 and 5. The areas of upward trend would contain 2,300 acres, while the area of slowed downward trend would contain 2,100 acres.

New water facilities. Range condition near new troughs would be expected to decrease by one class (see p. 3-15). On the affected acreage, forage utilization and trampling would be expected to cause impacts similar to those observed near existing water: reduced forage production, increased bare ground, a decline in plant vigor, and an increase in plants with limited forage value. Alternative F would impact 2,125 acres. The impacts would be as listed in Table 3-3, except that there would be no change in Pastures 4 and 5, and only 1,300 acres would be changed in Pasture 3.

Rangewide. Since Alternative F involves moderate utilization of forage and flexibility to adjust stocking levels, the increased number of AUMs would not be expected to cause any change in condition classification away from water supplies (see p. 3-16). In the event summer grazing allowed moderate use of tobosa, it is likely that grama grasses would be over-utilized, which could lead to significant deterioration in condition in the Mesa grasslands. The proposed monitoring program is expected to prevent this impact.

POISONOUS PLANTS

Poisonous species would be expected to increase near new water facilities, especially in the Bolson.

THREATENED OR ENDANGERED PLANTS

The Kuenzler hedgehog cactus, an endangered species, would not be affected by Alternative F, since it is a hardy species which can survive in areas of light to moderate grazing.

OTHER IMPACTS

Cover. The 2,125 acres of land near new water facilities would experience a substantial decrease in canopy cover, and a net decrease in plant density of as much as 50 percent (see p. 3-17). A two-fold increase in cover would occur in existing water facilities on the 2,300 acres near existing water facilities, where grazing would be eliminated. Lesser changes would be expected on the 2,100 acres where grazing would continue. The improved cover near existing water would offset losses near new water facilities. Away from water, cover would not be expected to change. Based on the above evaluation, it is reasonable to project a net zero change in cover as a result of Alternative F.

Vigor. Termination of the existing practice of growing-season rest would allow grazing of key forage species during their growth cycle, thus decreasing vigor. Elimination of utilization in upland pastures would lead to stagnation of plants in those areas, further decreasing vigor. On the other hand, where livestock graze areas which are now lightly utilized, Alternative F would improve the vigor of many forage species (see p. 3-18). Species such as needlegrass would definitely be enhanced by increased grazing, since stagnation results from the present levels of utilization. The improved vigor would potentially offset some of the predicted decrease in productivity.

Litter; fire. Overall, the increased utilization of forage would reduce litter and standing dead material, especially near new water facilities. However, some increases in litter would occur in the upland areas (see p. 3-18). On balance, the net change would be relatively small.

SUMMARY

Prediction of impacts from Alternative F is based on relationships between vegetation and grazing management which are described in the literature, or

which were observed during the 1979 field study. The most fundamental changes resulting from the management program would be a more even distribution of livestock, and an increase in the number of cattle and wildlife AUMs. The literature and field observations agree that a more even distribution of animals will generally benefit the vegetation resource. On McGregor, such benefits would be especially apparent near existing water facilities, which would experience a reduced grazing pressure when new water facilities are in place. In areas where grazing would be eliminated, improvements to vegetation would include a reversal in range condition and a considerable increase in cover. On areas where grazing would be reduced, the effects would be smaller, but similar.

Near new water facilities, heavy grazing would impact species composition to the point that condition would deteriorate by one class. In these areas there would be a reduction in canopy cover, and a reduction in productivity. These changes are an unavoidable consequence of any program which proposes to change the distribution of livestock within the Co-use area, and which involves a more complete harvesting of the available forage resource.

Quantified impacts include the following.

1. Development of improvements would cause the short-term loss of 89 acres of productive vegetation, of which 72 acres would be lost permanently.

2. Near new water facilities, grazing and trampling would cause the deterioration of range condition over an estimated 2,125 acres, leading to reduced herbage production, ground cover, and vigor, as well as a change in composition toward less palatable species. This acreage would decrease in condition by one class.

3. Over the fourteen pastures, changes in utilization would be reflected by a decrease in productivity which would not exceed ten percent.

4. Downward trends would continue on 2,100 acres near existing water facilities, although the rate of deterioration would slow. On 2,300 acres where grazing is eliminated, the downward trend would be reversed.

PHYSICAL SETTING

No impacts on climate, topography or geology would occur.

Air quality. Rates of wind erosion would be unchanged from existing conditions, and TSP related to wind-borne dust would not be affected. Air quality standards for TSP would continue to be violated on the Range. Emissions would occur from any new pumps which are not wind-powered. Increased traffic dust and exhaust would result from the traffic on newly developed roads. There would be temporary equipment emissions and dust associated with construction activities. Measurable changes from these effects would probably be limited to the temporary effects of construction.

Noise. Noise from construction equipment, pumps, and traffic would disrupt sensitive wildlife species, such as antelope (see p. 3-21). New impacts would occur on 158 acres affected by proposed construction. Permanent increases in intermittent noise levels would be experienced on 35 of the 158 acres, which would increase the area affected by noise by 15 percent compared to present conditions.

Summary. Noise which would result from construction activity, pump operation, and traffic would disturb antelope and other wildlife in small, localized areas.

SOILS

Erosion. Alternative F would result in little if any change in productivity or cover. Consequently, existing rates of wind and water erosion would be unchanged. Local increases in erosion near new water facilities would be offset by decreases near the existing water supplies.

Compaction. Based on comparisons to existing water facilities, the soil within an area of up to 10 acres around new water facilities would be compacted by cattle trampling (see p. 3-24). The total affected area would amount to about 490 acres. The compaction would decrease infiltration capacity, especially on clay soils. The reduction in infiltration would cause a reduction in available soil moisture in the root zone and, where sizeable, would reduce seed survival.

On acres directly affected by construction, earth-moving activity would be expected to alter or destroy existing soil structures. Impacts would be most significant where ripping equipment is used to penetrate caliche and fractured bedrock.

Summary. Alternative F is expected to have little effect on soil erosion. Soil structure would be destroyed at construction sites, and trampling would cause compaction and related physical changes on about 490 acres near new water facilities. Soil moisture and infiltration capacity would be reduced and erosion would increase near the new facilities. Opposite effects would be observed in areas near existing water supplies.

WATER

The increase in cattle, deer, and antelope AUMs would cause a net change in the consumption of water by animals from 50 to 60 acre-feet per year. This estimate is based on increased AUMs, and does not reflect any additional water use associated with summer grazing. The amount of surface area in troughs and water storages would increase from 6 to 11 acres, increasing evaporation losses from 36 to about 66 acre-feet per year. Total use would increase from 86 to 126 acre-feet in an average year. The change would be small when compared to the total water resources of the Range. The increase in cattle numbers during

a shortened grazing season would require more intensive management by BLM in order to ensure that all active troughs receive an adequate supply of water. Also, there would be increased use of dirt tanks because these reservoirs are gener- ally full in fall and winter periods.

WILDLIFE

Game animals. Alternative F would allow optimal populations to be reached. The optimal estimates are presented on p. 3-27; population data are given in Table 3-6. Estimates of deer AUMs are presented in Table 3-3. Average deer population would change from 3,730 to 5,096, an increase of 1,366 animals. The 1979 field studies did not identify any substantial conflicts between livestock grazing and deer in the Mountain Foothills and Canyonlands natural units. Heavy cattle grazing near water troughs in the Canyonlands has adversely affected the vegetation, but large areas of adequate habitat remain. Moreover, grazing by cattle has beneficial effects on the palatability of deer browse (see p. 3-28). Although forage would be available to support increases in both deer and cattle numbers, some competition for forage would occur, especially in winter when cattle may browse mountain mahogany. In adverse years, the competition would adversely affect deer. However, the monitoring program outlined in Appendix B would be expected to ensure that excessive competition for browse species is avoided. Near new water facilities, significant changes in cover would occur, and cattle numbers would be increased for prolonged periods. Deer tend to avoid areas where cattle numbers are high. Consequently, areas near new water would no longer be considered primary deer habitat.

NMDGF estimates optimal antelope densities at 4 per square mile in the Mesa natural unit. Table 3-6 lists the projected antelope populations, by pasture. AUM equivalents are given in Table 3-3. The herd size is projected to increase from 253 to 689 animals. As discussed on p. 3-3, species of special importance to the antelope diet, such as forbs, do not appear to be adversely affected by present levels of grazing. These plants would benefit from spring rest. In most years, benefits to antelope would be minimal. However, elimination of cattle-antelope competition for forage during spring would be beneficial to antelope during a drought period.

In the 2,125 acres near new water facilities, habitat changes and increased trampling would reduce the effective habitat available to game birds, and would cause a decrease in species abundance. Reductions would be offset to some extent because of the increased availability of water. Dove and Gambel's quail populations would increase with more watering holes, while scaled quail would probably not be affected. Overall, the anticipated change would be expected to be small, as substantial unaltered habitat would remain throughout the Range.

Small mammals. Alternative F would be expected to maintain existing small mammal populations, except near new water facilities where increased cattle use would reduce populations and biomass of herbivorous rodents on heavily grazed areas near new water. The new water would also enhance the habitat for some types of wildlife, by creating a more diverse environment, and by causing some

changes in the species composition of the plant cover (reflected by the deterioration in range condition in these areas). Near existing water, especially in the nongrazed uplands, the opposite effects would occur. For the Co-use area as a whole, the number of mammal species would increase. Jackrabbit populations would be expected to increase, while desert cottontail would decline. It is not possible to quantify these impacts, but they would be small due to the limited acreage involved. The addition of water itself would not be expected to have benefits, as distribution of these mammals is generally not related to water supplies.

Other animals. Construction activities would permanently destroy small areas of habitat. Temporary displacement of most species would occur near sites of active construction. New fences (such as at corrals) would provide perch sites for birds and lizards. Perches at new water facilities would have the same benefit. Populations of some non-game birds, especially ground-nesting species, might decline slightly near new water and in areas near existing supplies. However, because of plant composition changes near the new water, other species would benefit, and overall bird diversity in these areas would increase. Seasonal use of the area by waterfowl may increase slightly. Most bird species would benefit from the additional availability of water. Summer grazing would have significant effects on reptiles due to trampling, especially near new water facilities. For example, the horned lizard and Mojave rattlesnake on Otero Mesa could be affected. It is not possible to quantify these impacts with existing data.

Threatened or endangered species. Effects on threatened or endangered species would be limited to a reduction in potential habitat caused by changes in range condition near new water facilities. This may have a minor effect on the peregrine falcon and on regionally threatened or endangered species.

Summary. Alternative F would generally protect or enhance the environmental conditions which presently support a diverse wildlife population on McGregor Range. Forage sufficient for wildlife needs would remain available even though livestock grazing would increase. Major changes to wildlife habitat would be limited to areas near proposed improvements, especially water facilities, where changes in the vegetation would benefit some species and have adverse effects on others. Increased availability of water and more intensive management would allow deer and antelope populations to increase. Cattle grazing would not impair the habitat of either of these large herbivores. Optimal populations of 5,096 deer (3,597 AUMs) and 689 antelope (435 AUMs) would be reached, although factors other than food and water could play a role in limiting growth of the herds. Populations of other wildlife species would generally be maintained. Introduction of water facilities would benefit species which can utilize the water or associated perch sites, or which are favored by decreases in cover and a greater diversity in vegetation. Animal species likely to be favored by new water facilities would include jackrabbits and waterfowl. The change in cover and vegetation would adversely impact other species, including scaled quail, cottontails, and ground-nesting birds.

CULTURAL RESOURCES

Impacts from Alternative F would be similar to, but less than, those from the proposed action (see p. 3-32). Increases in livestock numbers on the Range would increase rates of deterioration of cultural resources, especially near proposed new water facilities and in proposed corrals (see p. 3-32). Impacts would be greatest at sites which contain ceramic remains at the ground surface, or which have structures with a floor and faint traces of adobe walls. The impacts would be especially significant in Pastures 1 and 3, which have a relatively high density of known habitation sites in those areas which would remain open to livestock.

Impacts associated with the proposed action (p. 3-33) would also occur with Alternative F. These include: minor damage to historic structures due to cattle rubbing; vandalism associated with access along new roads; possible increased damage by higher rates of wind and water erosion. All of the impacts discussed above would result in a reduction of information available for the study of human civilization in the past, but all would be minimized by locating new facilities away from particularly valuable sites.

VISUAL RESOURCES

After implementation of Alternative F, 450 square miles would remain in VRM Class III and 354.7 square miles would remain in VRM Class IV.

WILDERNESS

Application of Section 603(c) of FLPMA would prevent any adverse impacts on potential wilderness areas (see p. 2-40).

RECREATION

Hunting potentials for game birds would remain unchanged. Big-game hunting opportunities are assumed to increase in direct proportion to increases in deer and antelope populations (see p. 3-34). To the degree that cultural resources are disturbed or destroyed, the potential for the eventual development of recreation-related cultural and natural history resource sites would be adversely affected. In the context of the existing and potential recreational use of the Range, these impacts would be minor.

LAND USE

Alternative F would reduce the amount of land which would be used for grazing purposes. The proposed action involves no components which would conflict with continued use of McGregor Range for military purposes. The expanded management program would require more intensive involvement by operators, as de-

scribed on p. 3-34. Increased grazing would lead to less litter, and there would likely be fewer acres of land lost to fires resulting from missile crashes and other defenses ordnance. In the Canyonlands and Mountain Foothills natural units, elimination of grazing would effectively convert 13,250 acres from suitable to potentially suitable for grazing. For the existing grazed area (271,000 acres), this would decrease the total acreage rated as suitable from 224,650 to 216,400.

TRANSPORTATION

Alternative F would involve 34.75 miles of access roads to new water facilities, which would increase access to sectors of the fourteen pastures which are presently difficult to reach using conventional vehicles. The increase represents an addition of 11 percent to the existing road network. Additional cattle trucks and road construction equipment would increase traffic by a few vehicles for a few days of the year. This increase would have a negligible effect on the daily vehicle counts listed in Chapter 2.

SOCIO-ECONOMIC CONDITIONS

Alternative F would increase the income which BLM obtains from grazing fees. The expected increase would be from $233,000 per year to $271,000 per year, or about $42,000 per year. This represents about 0.11 percent of the total personal income of Otero County. BLM's management program would be considerably less costly than under the proposed action, because of the limited need to maintain water facilites in the upland pastures, where access is difficult and travel is time-consuming. Benefits to lessees would increase from $994,800 per year to $1,287,700 per year, a gain of $292,900 or 29 percent. To the extent that summer grazing is provided, weight gains would be greater than under other alternatives. This benefit has not been included in the above estimates. Also, during summer grazing operators would not incur the expense of buying and placing protein supplements. The total benefits from the alternative represent 0.3 percent of the total value of New Mexico's beef industry and 12 percent of the industry value in Otero County. However, most of the income would continue to be received outside Otero County and earned outside New Mexico.

SUMMARY OF IMPACTS, CHANGES IN PRODUCTIVITY, AND RESOURCE COMMITMENTS

This section provides information on Alternative F which is similar to the information provided about the proposed action in Chapters 4, 5, 6, and 7.

MITIGATION MEASURES

All proposed mitigation is described in Chapter 1 as part of the design features of the proposed action (Table 1-1).

UNAVOIDABLE ADVERSE IMPACTS

The most significant impacts listed above, which are adverse and which cannot be mitigated, are summarized in this section.

Vegetation. A downward change of one condition class is projected to occur on 2,125 acres within the existing fourteen pastures. Under a worst-case analysis, changes in utilization of forage would cause a reduction in herbage yields of up to ten percent rangewide, from 560 to 502 pounds per acre per year. In the near-water areas, canopy cover would decrease, basal cover would increase, and total plant cover would decrease as much as 50 percent. However, improved cover near existing water would offset this effect. Construction of improvements would cause disturbance or removal of vegetation on 89 acres, of which 72 acres would be affected over the long term. The remainder (pipeline routes) would experience short-term impacts.

Physical setting. Effects of Alternative F on the physical setting of McGregor Range would generally be too small to measure. Construction would cause localized temporary emissions of air pollutants and an increase in noise levels to 65 to 70 decibels (with peaks to 80 decibels). The noise would adversely affect as much as 158 acres of wildlife habitat.

Soils. Construction of improvements would disrupt soil structure on 89 acres. Cattle trampling would increase soil compaction on a total of 490 acres. Compaction would result in decreased infiltration capacity.

Water. Water consumption by cattle and wildlife would increase from 50 to 60 acre-feet per year. Evaporation from stock and wildlife water supplies would increase from 36 to 66 acre-feet per year.

Wildlife. The alternative would have no substantial adverse effects on the overall wildlife resources on McGregor Range. Near new water sources, increased use of forage by cattle and resulting decreases in forage production and canopy cover, would reduce populations and biomass of herbivorous rodents, cottontail rabbits, and some birds and predator species. Summer grazing could adversely affect horned lizards and the Mojave rattlesnake. Temporary displacement of deer, antelope, game birds, and small vertebrates would occur near active construction sites. Construction would permanently destroy 72 acres of wildlife habitat.

Cultural resources. Mitigation measures would minimize the effect of Alternative F on cultural resources. However, resources would be affected by increased trampling and rubbing by cattle, especially in areas near new water facilities.

Other resources. No adverse impacts have been identified which would substantially alter visual resources, wilderness, recreation, land use, transportation, or socio-economic conditions.

RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The alternative involves a tradeoff between: 1) increased benefits from the harvest of vegetation by cattle, deer and antelope, accompanied by stabilized range condition in presently overgrazed areas; and 2) decreased production of vegetation, associated with substantial adverse environmental changes near new water facilities. The tradeoff would bring forage production and utilization into a balance, unlike the existing situation where productivity is high, but utilization is light. The balanced production and harvest would provide a sustained yield of vegetation at a level which would support 17 percent more herbivore grazing than now occurs.

All significant benefits and impacts from Alternative F relate to the long-term use of the Range over a 20-year period or beyond. Benefits from the project include: a more even distribution of livestock within the existing pastures; stabilization of downward trends in condition near existing water supplies; an increase in forage utilization; an increase in plant vigor in areas now subject to light or slight utilization; protection of forage and provision of water for large game animals (deer, antelope); an increase in livestock numbers and AUMs; and an increase in income within the private cattle industry of about $292,900 per year.

The improved distribution of animals and the increase in forage harvest would cause the following losses in productivity: 72 acres of grazing land and wildlife habitat would be permanently lost; range condition would decrease by one class on about 2,125 acres; forage production would decrease by no more than ten percent; 490 acres of soil would experience an increase in compaction; and 13,250 acres would change from suitable to potentially suitable for grazing.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section identifies resource commitments associated with Alternative F which are irreversible (incapable of being reversed) and irretrievable (once used, cannot be replaced).

1. Construction of improvements would result in the permanent elimination of 72 acres of vegetation and wildlife habitat, and the permanent change in the soil structure on 89 acres.

2. Water use would increase by 40 acre-feet per year.

3. Cultural resources affected by trampling, rubbing or erosion would suffer an irreversible deterioration in condition. Once disturbed, resources are more difficult to recover and interpret properly, causing a data gap. Excavation of resources at construction or salting sites would recover information which is available to current techniques, but would foreclose the opportunity to gather additional information which might be recovered by future improvements in technique.

4. Investments of construction funds and materials for range improvements would represent a permanent commitment of these resources.

CHAPTER 9

CONSULTATION AND COORDINATION

CHAPTER 9. CONSULTATION AND COORDINATION

The McGregor Range Environmental Impact Statement (EIS) was prepared by Lee Wilson and Associates, Inc. of Santa Fe, New Mexico, under contract to and in conjunction with the Bureau of Land Management (BLM). A list of persons involved in the preparation of the EIS is provided in Table 9-1. BLM reviewers and contributors are listed in Table 9-2.

PREPARATION OF THE DRAFT ENVIRONMENTAL STATEMENT

BLM published a Notice of Intent to Prepare an Environmental Impact Statement in Volume 44, number 102 of the 24 May, 1979 Federal Register pp. 30171 to 30172. A copy of the Notice of Intent was sent to the New Mexico State Planning Division. A Public meeting was held in Alamogordo on June 28, 1979. Announcement of that meeting was publicized in local newspapers in June 1979. At the meeting, the Bureau solicited public information, concerns, problems and issues for possible inclusion in the impact statement. No formal statements were submitted at the meeting. No subsequent correspondence was received.

The McGregor team formally organized in June 1979. Work on the EIS began on June 26, 1979. Ft. Bliss personnel escorted team members on extensive ground tours of the Range and an air tour was arranged prior to field work which was conducted from July to mid-August. Writing of the EIS commenced in late August; the document was published in April, 1980. During preparation of the document, the EIS team sought expertise and opinions from local, State and Federal agencies, as well as universities and private individuals. Communications varied from formal written comments to informal personal contacts. Letters from the U.S. Fish and Wildlife Service and the New Mexico State Historic Preservation Officer are cited in the EIS. The full text of these letters is provided in Appendix H. A summary of additional contacts and comments follows.

FEDERAL AGENCIES

U.S. Department of the Army, Fort Bliss,Texas

Glenn Degarmo, Environmental Officer: furnished information on cultural resources; expressed concern for preservation of Oliver Lee pipeline.

Pete Atkins, Provost Marshall's Office: furnished historic information on the Range and the local area; provided information about hunting on the Range; discussed creosote increase.

James W. Conyers, Jr., Chief, Environmental Protection Office: furnished water rights information.

Kevin von Finger, Ecologist: furnished information on animal species adjacent to the study area and statistical information on Range fires.

Martin Lewis, Range Rider: provided extensive comments on range management, comparative value of pastures for livestock grazing; discussed the history of the Range and the surrounding area.

Emil Bentley, Foreman, Water Production Section: comments on Orogrande Pipeline.

TABLE 9-1. LIST OF PREPARERS.

NAME	EIS RESPONSIBILITY	EDUCATION
PRIMARY CONTRACTOR		
Lee Wilson	Preparation of EIS	Ph.D., Geology Columbia University
Stevan T. Anderson	Physical setting, soils, visual resources	M.A., Geography University of New Mexico
Catherine Callahan	Editorial	M.S., Regional Planning and Environmental Studies University of Wisconsin
Ann Claassen	Water	B.A., Chemistry University of New Mexico
Carole R. Cristiano	Wilderness, recreation, transportation, land use, socio-economics	M.U.A., Urban Affairs University of Colorado
Diane Fanelli	Editorial	B.S., Social Work University of Wisconsin
Dave Jenkins	Water	B.A., Geology Southern Illinois University
Gail McGough	Water	B.A., Chemistry University of New Mexico
SUBCONTRACTORS		
B. L. Allen	Soils	Ph.D., Soils Michigan State University
Bill Dahl	Vegetation	Ph.D., Range Management University of Idaho
Leroy Daugherty	Soils	Ph.D., Soils Genesis Cornell University
Leland Gile	Soils	M.S., Soils University of Wisconsin
Ken Lord	Cultural Resources	Ph.D. program, Archaeology, University of Texas at Austin
Russ Pettit	Vegetation	Ph.D., Range Management Oregon State University
Richard A. Smartt	Wildlife	Ph.D., Zoology University of New Mexico
Ronald Sosebee	Vegetation	Ph.D., Plant Physiology Utah State University
Al Ward	Cultural resources	M.S., Anthroooology University of Arizona

Source: Lee Wilson and Associates, Santa Fe, NM.

TABLE 9-2. BLM REVIEWERS AND CONTRIBUTORS.

NAME	POSITION	BLM OFFICE
Edward L. Webb	Contracting Officer's Authorized Representative	Las Cruces, New Mexico
Thomas Birch	Watershed/Range Specialist	Las Cruces, New Mexico
Don G. Boyer	Writer/Editor	Santa Fe, New Mexico
Bruce G. Call	Soil Scientist	Las Cruces, New Mexico
Beverly Cochran	Sociologist	Santa Fe, New Mexico
Leo Flynn	Archaeologist	Santa Fe, New Mexico
Herbert Garn	Hydrologist	Santa Fe, New Mexico
Rena A. Gutierrez	Writer/Editor	Las Cruces, New Mexico
Kenneth Holmes	Wildlife Specialist	Las Cruces, New Mexico
Elizabeth Hummer	Environmental Specialist	Santa Fe, New Mexico
William Leifeste	Chief, Division of Resource Mgmt.	Las Cruces, New Mexico
Gary B. Marsh	Outdoor Recreation Planner	Las Cruces, New Mexico
William Mathwig	Range Conservationist	Las Cruces, New Mexico
Duane D. Michael	Range Specialist	Santa Fe, New Mexico
Geoffrey B. Middaugh	Recreation Specialist	Santa Fe, New Mexico
Larry Nunez	Area Manager	Las Cruces, New Mexico
Candace N. Ojala	Archaeologist	Las Cruces, New Mexico
Teodoro Rael	Regional Economist	Santa Fe, New Mexico
Daniel C. B. Rathbun	District Manager	Las Cruces, New Mexico
Verlyn D. Saladen	Soil Scientist	Santa Fe, New Mexico
Donnie Sparks	Division of Rangeland Mgmt. Staff	Washington, D.C.
Lee L. Upham	Wildlife Biologist	Santa Fe, New Mexico
Karen Way	Archaeologist	Las Cruces, New Mexico
Edward L. Webb	Environmental Coordinator	Las Cruces, New Mexico
John W. Whitney	Environmental Coordinator	Santa Fe, New Mexico
Dan Wood	Wilderness Specialist	Santa Fe, New Mexico

Source: Bureau of Land Management, Las Cruces District.

U.S. Geological Survey, Albuquerque, New Mexico
Doug Posson, Chief, Computer Section: furnished ground-water data from OMNIANA and WATSTORE Data Management Systems.

U.S. Forest Service, Alamogordo, New Mexico
Cliff Landers, Soil Scientist: provided comments on application of the Universal Soil Loss Equation.

U.S. Fish and Wildlife Service, Albuquerque, New Mexico
Jack Bowman, Biologist: provided information on threatened or endangered species.

U.S. Soil Conservation Service, Albuquerque, New Mexcio
Paul Boden: furnished technical data on cover-runoff relationships; provided scientific plant nomenclature
Rick Swanson and Oran Bailey: furnished sediment yield and erosion control information; provided standard series descriptions.

U.S. Soil Conservation Service, Alamogordo, New Mexico
Preston Radcliff and Louis Figueroa: provided unpublished manuscripts and field sheets of Otero County Soil Survey Report.

U.S. Soil Conservation Service, Field Office, Santa Fe, New Mexico: furnished information on precipitation rates and New Mexico plant species.

NEW MEXICO STATE AGENCIES

New Mexico Department of Game and Fish, Santa Fe and Las Cruces, New Mexico
Jack Herring, Project Leader, Big Game Survey: provided information on deer, antelope, and game bird populations and surveys; commented on access difficulties and lack of population information on McGregor Range.
Dr. John P. Hubbard, Assistant Chief, Game Management, Endangered Species Project: provided information on threatened or endangered species of New Mexico.

New Mexico Historic Preservation Bureau, Santa Fe, New Mexico
Thomas W. Merlan, State Historic Preservation Officer: provided information on historic preservation rules and regulations, National Registry guidelines.

New Mexico Natural Resources Department, Parks and Recreation Division, Santa Fe, New Mexico
Robert M. Findling, Parks Planner-Director: provided information on state recreational facilities in the area near McGregor Range.

EDUCATIONAL INSTITUTIONS

New Mexico State University, Las Cruces, New Mexico
Dr. Gary B. Donart, Range Plant Physiologist: comments on McGregor Range condition.

Kirk McDaniel, State Range Extension Manager: comments on vegetation sampling techniques and McGregor Range condition.
Patrick Beckett, Cultural Resources Management Divison: furnished information on archaeology of the area

University of New Mexico, Albuquerque, New Mexico
Donna Cole, Graduate Student: provided comments about the unusual summering habits of horned larks and lark buntings on the Range.

University of Texas at El Paso, Texas
Dr. Robert Webb, Department of Biological Sciences: provided comments on unexpected presence of short-horned lizard and Mojave rattlesnake on McGregor, attributing this phenomenon to the excellent cover and abundance of prey animals.
Dr. Arthur H. Harris, Department of Biological Sciences: comments on differences in evolutionary grazing pressures and the need to correlate stability factors in Great Plains type grasslands with southwest grasslands; described unusually large long-tailed weasel (Mustela frenata) sighted on Otero Mesa, which may be species spotted in unsubstantiated sightings of black-footed ferret (Mustela nigracans)
Dr. Keith Redetske, Department of Biological Sciences: comment on the need to exercise caution when extrapolating grazing study information from one geographic region to another.

Museum of Northern Arizona, Flagstaff, Arizona
Alan P. Dulaney, Chief of Texas Archaeological Survey (TAS) team, 1975/76: comments on survey techniques, interpretation of site and relative accuracies of TAS and McGregor archaeological surveys.

PRIVATE GROUPS OR INDIVIDUALS

Timberon Corporation, Timberon, New Mexico: provided comments on economic advantages of access to Timberon through Culp Canyon.
Charlie Lee, Rancher, Alamogordo, New Mexico: furnished comments on BLM's management of McGregor Range grazing program.
Clark Champie, El Paso, Texas: provided information on endangered plants.

COORDINATION IN THE REVIEW OF THE DRAFT ENVIRONMENTAL STATEMENT

Comments on the draft environmental statement will be requested from the following agencies and interest groups.

CONGRESSIONAL DELEGATION, AND STATE LEGISLATORS NEW MEXICO

U.S. Senator Pete Domenici
U.S. Senator Harrison Schmidt
U.S. Representative Harold Runnels
State Senator Wyatt Atkins

State Senator John E. Conway
State Representative George E. Fettinger
State Representative Maurice Hobson
State Representative John L. Mershon

FEDERAL AGENCIES

U.S. Department of Agriculture
- Forest Service
- Soil Conservation Service
- Agricultural Stabilization and Conservation Service

U.S. Department of the Army
- Deputy Assistant Secretary of the Army, Headquarters, Department of the Army, Washington, D.C.
- Army Corps of Engineers
- White Sands Missile Range
- Holloman Air Force Base
- Fort Bliss
  - Gen. John B. Oblinger, Jr., Commanding General of Fort Bliss
  - Col. Rodriquez, Director of Facilities Engineering
  - Col. Edwin Wasinger, Judge Advocate General

U.S. Environmental Protection Agency

U.S. Department of the Interior
- Advisory Council on Historic Preservation
- Fish and Wildlife Service
- Bureau of Land Management
  - Las Cruces District Grazing Advisory Board
    - Bob Jones
    - Wally Ferguson
    - Rubin Pankey
    - Wilfred Cothern
    - Jim Culberson
    - Langford Keith
    - Ed "Smokey" Nunn
- Water and Power Resources Service
- Heritage Conservation Recreation Service
- U.S. Geological Survey
- Bureau of Mines
- National Park Service

U.S. Department of Transportation

NEW MEXICO STATE AGENCIES

Office of the Governor
New Mexico Farm and Livestock Bureau
Clearing House Bureau
State Planning Division
Department of Game and Fish
Environmental Improvement Division
Historic Preservation Bureau

Highway Department
State Land Office
Parks and Recreation Division
Eastern New Mexico University
New Mexico State University
University of New Mexico

TEXAS STATE AGENCIES

Office of the Governor
Budget and Planning Office
Department of Highway and Public Transportation
Texas Air Control Board
Texas Parks and Wildlife Department
Texas Historical Commission
Texas Tech University
University of Texas at El Paso

REGIONAL AND LOCAL AGENCIES

Southern Rio Grande Council of Governments
Southeast New Mexico Economic Development District
Otero County Planning and Zoning Commission
Dona Ana County Planning and Zoning Commission
Sureste Resource Conservation and Development District
Llano Estacado Resource Conservation and Development District
South-Central Mountain Resource Conservation and Development District
Mayor, City of Las Cruces
Mayor, City of Alamogordo
Mayor, City of El Paso, Texas
Alamogordo Chamber of Commerce
Las Cruces Chamber of Commerce
El Paso Chamber of Commerce
Otero County Commissioners
Dona Ana County Commissioners
El Paso County Commissioners
Otero County Assessor
El Paso Centennial Museum

CONSERVATION ORGANIZATIONS

New Mexico Conservation Coordination Council
Sierra Club
Rio Grande Chapter Sierra Club
New Mexico Wildlife Federation
National Wildlife Federation
National Council of Public Land Users
Natural Resources Defense Council
Wildlife Management Institute

Central New Mexico Audubon Society
Wilderness Society
Friends of the Earth
Southwestern New Mexico Audubon Society
Carlsbad Sportsman's Club
Chaves County Wildlife Federation
Public Lands Council
Otero County Wild Turkey Federation
Dona Ana County Associated Sportsmen, Inc.
New Mexico Ornithological Society
Jornada Resource Experimental Station
New Mexico Association of Natural Resource Conservation Districts
New Mexico Wilderness Study Committee
Oregon Environmental Council
Nevada Outdoor Recreation Association
Ada County Fish and Game League

LIVESTOCK ORGANIZATIONS

Southeastern New Mexico Livestock Grazing Association
New Mexico Cattle Growers' Association
New Mexico Cattlemens' Association

PROFESSIONAL SOCIETIES

Society for Range Management
Soil Conservation Society of America
Wildlife Society
Ecological Society
The Wilderness Society

OTHER GROUPS

COAS Publishing and Research
Department of Anthropology, Arizona State University
Southwest Research and Development Company
New Mexico Oil and Gas Association
Yates Petroleum Corporation
Mississippi Chemical Corporation
Free Wheels ORV Club
Prairie Dawgs M/C
Timberon Corporation

INDIVIDUALS

Livestock permittees (1979-80)
- Darr Angell
- B.B. Johnson
- Harvey Jones
- Felix Cattle Co.
- Ted Richardson

Farr & Harvey
Louis Wardlaw
Pascoe & Stadtler
Bebo Cree
Tom Garcia
Salvador Gutierrez
Gary Bowers
Tammy Finarelli
Dr. Gary L. Cunningham
Dr. William A. Dick-Peddie
Dr. John A. Ludwig
Dr. Rex D. Pieper
Dr. Reldon R. Beck
Dr. Gary B. Donart
Dr. Ralph J. Raitt
Dr. Richard W. Spellenberg
Dr. Walter G. Whitford
Dr. Stephan Hatch
Dr. Walter H. Conley
Jim Stephenson
Donald E. Weaver, Jr.
Stanley E. Green

A public hearing on this draft EIS will be held in Alamogordo, New Mexico. Public comment on and input to the proposed grazing management plan will be solicited through formal oral testimony, and subsequent written statements will be accepted. The public will be notified by publication in the Federal Register 30 days prior to the hearing. In addition, advertisements in local newspapers, use of a mailing list, and additional news media coverage will take place prior to the hearing. A reference file is available for public review at the Bureau of Land Management Las Cruces District Office, at 1705 North Valley, Las Cruces, New Mexico. Copies of this draft EIS will be made available upon request. A summation of public response will be incorporated as a part of Chapter 9 in the Final Environmental Impact Statement.

APPENDICES

APPENDICES

APPENDIX A: PROPOSED FACILITIES

Table A-1 summarizes information on the facilities which would be constructed if the proposed action is implemented: type of facility, number of existing and proposed facilities, acres disturbed by construction of each unit; total acres disturbed; the cost of the facilities; a description of the improvements. Table A-2 indicates the cost and type of range improvements, by pasture. Table A-3 compares the number of existing and proposed facilities of each type, by pasture. Table A-4 details the anticipated facility scheduled construction.

TABLE A-1. FACILITIES TO BE CONSTRUCTED IF THE PROPOSED ACTION IS IMPLEMENTED.

Type of Facility	Existing Facilities	Proposed Improvements	Acres disturbed per unit	Total acres disturbed[b]	Cost of Improvements	Description
Water Troughs	90	77	0.1	8	$ 35,550	Commercial metal troughs or modified missile containers; all would have bird ladders to protect birds and small mammals from drowning
Storage Tanks						Steel, cylindrical shape; 19 tanks, each with 10,000 gallon storage capacity, would be placed at proposed wells; 18 tanks, each with 5,000 gallon capacity, would be placed at troughs; one 30,000 gallon capacity tank would be placed at Culp Rim.
300 gal.	1					
1,000 gal.	1					
5,000 gal.	7	18	0.2	4	108,000	
6,000 gal.	2					
10,000 gal.	2	19	0.2	4	123,500	
14,000 gal.	1					
16,000 gal.	2					
20,000 gal.	4					
30,000 gal.	1	1	0.2	0	40,000	The new 2,000,000 gallon tank would be constructed of butyl-rubber; it would be placed at a low point in unit 9, for storage of water which is to be pumped through pipelines on southern pastures.
50,000 gal.	1					
70,000 gal.	2					
90,000 gal.	1					
110,000 gal.	4					
2,000,000 gal.	1	1	1.2	1	20,000	
Water Pipelines	(miles)					Water would be piped to Rim Tank, then to storage tanks and troughs throughout the Range. New pipelines would be laid to distribute water to new storage tanks and troughs. PE (polyethylene) pipe would be laid by crawler type tractor and pipe laying machines, which would dig a 4" wide trench, lay pipe and cover trench. PVC (polyvinyl-chloride) pipe will be laid in sections in cleared trench, then covered.
1 inch steel	1.53					
1 inch plastic	16.17					
1 1/4 inch steel	7.74					
1 1/4 inch PE	12.5	28.5	0.36	10	51,300	
1 1/2 inch PVC	11.65	10.0	0.36	4	50,000	
2 inch steel	30.18					
2 1/2 inch plastic	5.64					
2 1/2 inch steel	5.01					
3 inch steel	3.97	17.5[a]	0.4	7	498,960	
4 inch steel	0.1					
Wells	6	19	0.25	5	407,500	500-1000 feet deep; pumping systems either submersible or jack type pumps or windmills. Power would be provided by gas, propane or wind.
Dirt Tanks	68	5	2.0	10	17,500	Sites prepared by using bulldozer to remove debris; cut-off trench would be dug to prevent water from flowing under dam: tank would be filled with clay-bearing soil scraped from above the dam. Spillways (with 3% or less gradients) or outlet pipes would be used.
Corrals	10	3	0.13	1	9,000	Wood; no more then 1/2 acre in size.
Roads	388 miles	46.75 miles	1.4	65	28,263	Unimproved dirt; constructed along proposed pipelines to facilitate maintenance and inspections.

a. Replacement of existing pipeline (2 inch, 2 1/2 inch and 4 inch diameter).
b. Figures rounded to nearest number.

TABLE A-2. TYPE AND COST OF PROPOSED RANGE IMPROVEMENTS BY PASTURE.

PE=polyethelene; PVC=polyvinylchloride

Pasture Number	Name	Type of Improvement	Unit	Approximate Cost Per Unit	Approximate Improvement Cost	Approximate Grazing Unit Cost
1.	Langford	Well, windmill, 200 ft.	5 each	$14,500.00	$72,500.00	
		Storage w/trough; 10,000 gal.	5 each	6,950.00	34,750.00	
		Corral	1 each	3,000.00	3,000.00	
		Road construction	2 miles	150.00	300.00	
						$ 110,550.00
2.	Cox Well	Pipeline 1 1/4" PE	1 mile	1,800.00	1,800.00	
		Well, windmill, 500 ft.	2 each	17,500.00	35,000.00	
		Storage w/trough; 10,000 gal.	2 each	6,950.00	13,900.00	
		Storage w/trough; 5,000	1 each	6,450.00	6,450.00	
		Troughs	5 each	450.00	2,250.00	
		Corral	1 each	3,000.00	3,000.00	
		Road construction	5 miles	150.00	750.00	
						63,150.00
3.	Culp	Pipeline 1 1/4" PE	6 miles	1,800.00	10,800.00	
		Pipeline 1 1/2" PVC	6 miles	5,000.00	30,000.00	
		Well, windmill, 1000 ft.	2 each	25,000.00	50,000.00	
		Storage w/trough; 10,000 gal.	2 each	6,950.00	13,900.00	
		Storage w/trough; 5,000 gal.	6 each	6,450.00	38,700.00	
		Troughs	14 each	450.00	6,300.00	
		Corral	1 each	3,000.00	3,000.00	
		Road construction	16 miles	150.00	2,400.00	
		Oirt tank (reservoir)	3 each	3,500.00	10,500.00	
		Storage; 30,000 gal.	1 each	40,000.00	40,000.00	
						205,600.00
4.	Lee	Pipeline, 1 1/4" PE	3 miles	1,800.00	5,400.00	
		Pipeline, 1 1/2" PVC	4 miles	5,000.00	20,000.00	
		Pipeline, 3" steel	3 miles*	28,512.00	85,536.00	
		Well, windmill, 1000 ft.	2 each	25,000.00	50,000.00	
		Storage w/trough; 10,000 gal.	2 each	6,950.00	13,900.00	
		Storage w/trough; 5,000 gal.	3 each	6,450.00	19,350.00	
		Troughs	9 each	450.00	4,050.00	
		Road construction	4 miles	2,000.00	20,000.00	
						218.236.00
5.	Cress-garden	Pipeline, 3" steel	1.5 mile*	28,512.00	42,768.00	
		Wells, windmill, 1000 ft.	2 each	25,000.00	50,000.00	
		Storage w/trough; 10,000 gal.	2 each	6,950.00	13,900.00	
		Oirt tank	1 each	3,500.00	3,500.00	
		Road construction	1.5 mile	150.00	225.00	
		Pipeline, 1 1/4" PE	0.5 mile	1,800.00	900.00	
		Trough	1 each	450.00	450.00	
						111,743.00
7.	Ruther-ford	Pipeline, 3" steel	2 miles*	28,512.00	57,024.00	
		Pipeline, 1 1/4" PE	2 miles	1,800.00	3,600.00	
		Troughs	3 each	450.00	1,350.00	
		Road construction	1.75 mile	150.00	263.00	
						62,237.00
8.	Oaggar	Well, windmill, 100 ft.	1 each	25,000.00	25,000.00	
		Storage w/trough; 10,000 gal.	1 each	6,950.00	6,950.00	
		Road construction	1 mile	2,000.00	2,000.00	
						33,950.00
9.	Mesa Horse Camp	Pipeline, 3" steel	1 mile*	28,512.00	28,512.00	
		Well, windmill, 1000 ft.	2 each	25,000.00	50,000.00	
		Storage w/troughs; 10,000 gal.	2 each	6,950.00	13,900.00	
		Storage, butyl-rubber, 2 million gal.	1 each	20,000.00	20,000.00	
		Pipeline, 1 1/4" PE	1 mile	1,800.00	1,800.00	
		Trough	2 each	450.00	900.00	
		Oirt tank	1 each	3,500.00	3,500.00	
						118,612.00

Table A-2. Continued.

Pasture Number	Name	Type of Improvement	Unit	Approximate Cost Per Unit	Approximate Improvement Cost	Approximate Grazing Unit Cost
10.	Wing-field	Pipeline, 3" steel	5.5 miles*	28,512.00	156,816.00	
		Pipeline, 1 1/4" PE	3 miles	1,800.00	5,400.00	
		Troughs, water	4 each	450.00	1,800.00	
		Road construction	4 miles	150.00	600.00	
						164,616.00
11.	Mary Toy	Well, windmill, 1000 ft.	1 each	25,000.00	25,000.00	
		Storage w/trough; 10,000 gal.	1 each	6,950.00	6,950.00	
						31,950.00
12.	Herd	Pipeline, 1 1/4 PE	1 mile	1,800.00	1,800.00	
		Troughs	2 each	450.00	900.00	
		Pipeline, 3" steel	3.5 miles*	28,512.00	99,792.00	
		Road construction	1 mile	150.00	150.00	
		Storage: 5000 gal.	1 each	6,000.00	6,000.00	
						108,642.00
13.	Martin Tank	Pipeline, 3" steel	1 mile*	28,512.00	28,512.00	
		Pipeline, 1 1/4" PE	7 miles	1,800.00	12,600.00	
		Storage: 5,000 gal.	5 each	6,000.00	30,000.00	
		Troughs	5 each	450.00	2,250.00	
		Road construction	5 miles	150.00	750.00	
						74,112.00
14.	Antelope	Pipeline, 1 1/4" PE	4 miles	1,800.00	7,200.00	
		Storages w/troughs; 5,000 gal.	2 each	6,450.00	12,900.00	
		Trough	1 each	450.00	450.00	
		Road construction	4 miles	150.00	600.00	
						21,150.00
15.	Shiloh	Well, windmill, 1000 ft.	2 each	25,000.00	50,000.00	
		Storage w/troughs; 10,000 gal.	2 each	6,950.00	13,900.00	
		Road construction	1.5 miles	150.00	225.00	
						64,125.00
TOTAL COST						$1,388,673.00

*Replacement of existing pipeline.

TABLE A-3. EXISTING AND PROPOSED RANGE IMPROVEMENTS.

E= existing facilities; P= proposed facilities.

Grazing Unit	Fencing (miles)		Pipeline (miles)		Water troughs		Water Storages		Dirt tanks		Wells		Corrals		Roads (miles)	
	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P
1. Langford	35	0	2	0	6	5	3	5	11	0	2	5	1	1	40	2
2. Cox Well	27	0	0	1	1	8	1	3	3	0	1	2	0	1	27	5
3. Culp	32	0	3.8	12	7	22	2	9	5	3	0	2	1	1	16	16
4. Lee	30	0	17.3	10	9	14	7	5	4	0	0	2	1	0	20	4
5. Cressgarden	16	0	14	2	15	3	5	2	7	1	0	2	1	0	24	1.5
7. Rutherford	19	0	7	4	7	3	2	0	6	0	0	0	0	0	28	1.75
8. Oaggar	24	0	0	0	4	1	2	1	5	0	2	1	2	0	34	1
9. Mesa Horse Camp	35.5	0	12.5	2	7	4	0	3	8	1	0	2	1	0	31	0
10. Wingfield	8	0	9.5	8.5	6	4	3	0	4	0	0	0	0	0	21	4
11. Mary Toy	13	0	3.5	0	7	1	2	1	4	0	1	1	1	0	40	0
12. Herd	9	0	5.0	4.5	4	2	2	1	0	0	0	0	0	0	16	1
13. Martin tank	20	0	13.8	8	9	5	3	5	4	0	0	0	1	0	52	5
14. Antelope	13	0	4.0	4	4	3	0	2	3	0	0	0	0	0	12	4
15. Shiloh	26	0	2.0	0	4	2	1	2	4	0	0	2	1	0	27	1.5
Total	307.5	0	94.4	56.0	90	77	33	39	68	5	6	19	10	3	388	46.75

TABLE A-4. MCGREGOR RANGE CONSTRUCTION IMPLEMENTATION SCHEDULE.

1981 - Replace steel main pipeline.

1982 - Replace steel main pipeline.

1983 - Replace steel main pipeline.

1984 - Replace steel main pipeline.

1985 - Construct all improvements in Unit 9 and 13 except one storage tank.

1986 - Construct storage tank in Unit 13 and complete projects for Units 10, 14, and 15.

1987 - Complete projects in Unit 1 and drill wells in Unit 5.

1988 - Complete projects in Unit 5 and start projects in Unit 3.

1989 - Complete projects in Unit 3 and start projects in Unit 4.

1990 - Complete projects in Unit 4 and start projects in Unit 2.

1991 - Complete projects in Units 2, 7, and 8.

1992 - Complete projects in Units 11 and 12.

Schedule is dependent on the amount of money received from the sale of forage, and the cost of routine maintenance and salaries. It is estimated that an average of $130,000 will be available each year for the construction of improvements.

APPENDIX B: PROPOSED MONITORING PROGRAM AND COOPERATIVE AGREEMENTS

MONITORING PROCEDURES

Annual monitoring would include evaluations of forage utilization and availability, range trend and condition, and wildlife utilization (BLM Manual 4412). The procedure for evaluating forage would be as follows: (a) field inspection of each pasture would occur each summer to determine whether or not grazing in the previous season caused too much or too little utilization of forage; (b) the actual utilization factor determined in step a would be divided into the proper utilization factor (50%) in order to determine a ratio which reflects overuse or underuse of the Range (a number less than 1 indicates overuse); (c) the AUMs allowed in the previous year would be multiplied by the ratio; (d) the result of step c would be the number of AUMs allowed in the following grazing season. The procedures for evaluation of utilization are described in Bureau of Land Management (BLM) Manual 4412.22.

The following example illustrates the procedure.

> Key species in pasture X have a proper utilization factor of 50%; 2,400 AUMs are allowed in 1985-86. In the summer of 1986, field inspection reveals that the actual use of the key species amounted to 60%. The ratio calculated in step c is 50% divided by 60% or 0.833. Multiplication of 2,400 by 0.833 equals 2,000. Therefore, in the 1986-1987 grazing season the allowable animal use would be 2,000 AUMs.

In unusually wet or dry years, BLM staff would use professional judgement to determine whether the formula should be modified.

The field studies would also determine range trend using methods outlined in BLM Manual 4412.22C. If necessary to prevent or reverse a downward trend in condition, units would be withdrawn from consideration for grazing for one or more grazing seasons. The withdrawn units would be rested to satisfy the basic physiological requirements of forage plants and other plants affected by grazing. Once a pasture had been rested it would be evaluated again the following year to determine whether or not additional resting is required. Wildlife use would not be controlled in rested pastures.

BLM staff would undertake field studies in areas which are unsuitable for grazing (due to factors such as steepness) to determine if wildlife use is excessive. If utilization of key forage plants (p. 3-2) or browse species exceeded 50% in such areas, the New Mexico Department of Game and Fish (NMDGF) would be notified as to the possibility of an overpopulation of large game animals. BLM and NMDGF would modify wildlife management as necessary to reduce excess populations.

Based on the field studies, BLM would reserve the right to change the grazing season, the amount of forage utilization allowed, and/or to specify the class of the grazing animals in each pasture.

COOPERATIVE AGREEMENTS AND RELATED DOCUMENTS

BLM is affected by a number of documents which govern the management of McGregor Range. These documents are reviewed below, in chronological order. Copies of all documents to which BLM or the Department of Interior (DOI) are parties are on file at the BLM District Office in Las Cruces.

1. Public Land Orders (PLO) No. 1470 and 1547, issued in 1957, withdrew public lands in McGregor Range for use by the Department of the Army (DOA) as a missile testing range. The withdrawal included about 608,400 acres of public lands previously administered by BLM, and approximately 18,000 acres of land administered by the Forest Service (USFS). (All acreage values are rounded off.) DOA acquired an additional 72,400 acres of intermingled private land, and the associated water rights. In 1977, DOA submitted an application for a new withdrawal (see item 5).

2. DOA and DOI entered into a Memorandum of Understanding in 1966. The agreement established a Co-use area where grazing of cattle would be permitted. The Memorandum was amended in 1976. Major provisions currently in force include the following.

a. BLM authorizes grazing use by cattle, under provisions of a vegetation sales contract. Adequate forage is allowed for maintenance of wildlife populations.

b. DOA has control over access to the Range, and provides fire control and suppression. DOA also controls the water supply which originates in the Sacramento River and Carrizo Springs.

c. BLM is responsible for construction of range improvements and firebreaks, maintenance of water supply facilities, and control of livestock trespass. All construction must have the concurrence of the Commanding Officer of the U.S. Army Air Defense Center (USAADC) at Ft. Bliss.

d. BLM retains all grazing fees for maintenance of the Range.

e. DOI has jurisdiction over mineral resources, which can be disposed of only after the Memorandum of Understanding is amended.

3. In 1974, USAADC, DOI and NMDGF entered into a Cooperative Plan Agreement for conservation of fish and wildlife resources on the Range. The agreement was amended in 1976 to more clearly define management roles. Important provisions include the following.

a. NMDGF is required annually to survey range conditions, herds and wildlife abundance on the Range. BLM may assist in the survey. Subsequent to each annual survey, BLM is to schedule a meeting of all sig-

natories to the Cooperative Plan Agreement. The purpose of the meeting is to develop annual programs concerning research and management of wildlife resources.

b. Hunting of antelope, deer and game birds is allowed on the Range during regular hunting seasons. However, hunting is not permitted during those times when it would interfere with military activities. By May 1 of each year USAADC is to provide NMDGF with a tentative schedule of allowable hunting dates. If it becomes necessary, USAADC can change or eliminate certain scheduled hunting days.

c. NMDGF and USAADC jointly maintain check stations for the purpose of controlling access and assigning hunters to specific hunting and camping areas.

d. U.S. Fish and Wildlife Service (FWS) has responsibility for predator control. BLM may initiate requests for control in areas adjacent to sheep allotments: FWS then initiates activities after coordinating with other parties to the Agreement. To date there has been very limited implementation of predator (coyote) control programs. FWS is to be consulted if the habitat of any threatened or endangered species were to be potentially affected by a proposed action.

4. DOA, BLM and the New Mexico State University (NMSU) Board of Regents entered into a Cooperative Agreement in 1978 to allow NMSU to perform a general inventory review of flora and fauna in four areas of black grama grasslands. These studies are intended to: protect and preserve the grassland areas; determine ecological changes; and report causes and effects of changes which result from the use of range management techniques. The results of the studies are to be transmitted to all signatories to the Agreement and used as a basis of comparison to grazed areas. Grazing is not allowed in the grasslands, and USAADC is to minimize military activity therein.

5. On January 11. 1977, DOA submitted to Congress an application for renewal of the withdrawal discussed in item 1. In effect, the action extended the withdrawal for 2 years. Congress did not act on the application. On January 8, 1979, DOA submitted another application for review. This application excluded the 18,000 acres of USFS land. As of August, 1979, there has been no legislation submitted to Congress which specifies the nature and conditions of the withdrawal. The BLM District Office in Las Cruces and DOA personnel at Ft. Bliss are preparing the specific wording of the legislation. A final Environmental Impact Statement (EIS) on the Army withdrawal has been filed with the U.S. Environmental Protection Agency.

APPENDIX C: VEGETATION

TABLE C-1. SPECIES LIST OF PLANTS ENCOUNTERED ON THE CO-USE AREA DURING AUGUST, 1979.

Names of species marked with asterisk (*) reflect reclassification since 1971.

GRASSES

Common Name	Code	Scientific name	Common Name	Code	Scientific name
Arizona threeawn	ARAR6	Aristida arizonica	Alkalai muhly	MUAS	Muhlenbergia asperifolia
Poverty threeawn	ARDI5	Aristida divaricata	Pine muhly	MUDU	Muhlenbergia dubia
Threeawn	ARIST	Aristida sp.	Muhly	MUHL3	Muhlenbergia sp.
Red threeawn	ARLO3	Aristida longiseta	New Mexico muhly	MUPA2	Muhlenbergia pauciflora
Purple threeawn	ARPU9	Aristida purpurea	Bush muhly	MUPO2	Muhlenbergia porteri
Wright's threeawn	ARWR	Aristida wrightii	Curlyleaf muhly	MUSE	Muhlenbergia setifolia
Cane bluestem	BOBA	Bothriochloa barbinodis*	Ring muhly	MUTO2	Muhlenbergia torreyi
Silver bluestem	BOSA	Bothriochloa saccharoides*	Halls panicum	PAHA	Panicum hallii
Sideoats grama	BOCU	Bouteloua curtipendula[a]	Vine mesquite	PAOB	Panicum obtusum
Black grama	BOER4	Bouteloua eriopoda	Burrograss	SCBR2	Scleropogon brevifolius
Blue grama	BOGR2	Bouteloua gracilis	Plains bristlegrass	SELE4	Setaria leucopila
Hairy grama	BOHI2	Bouteloua hirsuta	Bristlegrass	SETAR	Setaria sp.
Field sandbur	CEIN4	Cenchrus incertus	Bottlebrush squirreltail	SIHY	Sitanion hystrix
Arizona cottontop	DICA	Digitaria california*	Alkali sacaton	SPAI	Sporobolus airoides
Plains lovegrass	ERLU	Eragrostis lugens	Spike dropseed	SPCO4	Sporobolus contractus
Hairy Tridens	ERPI	Erioneuron pilosum*	Sand dropseed	SPCR	Sporobolus cryptandrus
Fluffgrass	ERPU	Erioneuron pulchellum*	Mesa dropseed	SPFL2	Sporobolus flexuosus
Tobosa	HIMU2	Hilaria mutica	Dropseed	SPORO	Sprorobolus sp.
Wolftail	LYPH	Lycurus phleoides	Needlegrass	STIPA	Stipa sp.
Ear muhly	MUAR	Muhlenbergia arenacea	Needlegrass	STLO	Stipa lobata
Sand muhly	MUAR2	Muhlenbergia arenicola	New Mexico feathergrass	STNE2	Stipa neomexicana
			Slim tridens	TRMU	Tridens muticus

FORBS

Common Name	Code	Scientific name	Common Name	Code	Scientific name
Wild onion	ALLI	Allium sp.	Marestail	CONY2	Conyza sp.
Pigweed	AMARA	Amaranthus sp.	Doveweed	CROTO	Croton sp.
Ragweed	AMBRO	Ambrosia sp.	Cryptantha	CRYPT	Cryptantha sp.
Doze daisy	APHA	Aphanostephus sp.	Wooly dalea	DALA3	Dalea lanata
Sagewort	ARTEM	Artemisia sp.	Jimsonweed	DATUR	Datura sp.
Milkweed	ASCLE	Asclepias sp.	Spectaclepod	DIWI	Dithyrea wislizenii
Desert baileya	BAMU	Baileya multiradiata	Draba	DRABA	Draba sp.
Hartweggs primrose	CAHA	Calyophus hartweggii*	Prickleaf dogweed	DYAC	Dyssodia acerosa
James rushpea	CAJA	Caesplinia jamesii	Buckwheat	ERAN4	Eriogonum annuum
Basketflower	CEAM2	Centaurea americana	Fleabane	ERIGE2	Erigeron sp.
False nightshade	CHAMAB	Chamaesaracha sp.	Euphorbia	EUPHO	Euphorbia sp.
Goosefoot	CHEN	Chenopodium sp.	Hairy evolvulus	EVNU	Evolvulus nuttallianus
Thistle	CIRSI	Cirsium sp.			

a. Includes B. warnockii.

Source of Nomenclature: SCS, 1971.

TABLE C-1. CONTINUED.

FORBS (continued)

Common Name	Code	Scientific name	Common Name	Code	Scientific name
Gaura	GAURA	Gaura sp.	Rough Nama	NAHI	Nama hispidum
Gilia	GIRI	Gilia rigidula	James nailwort	PAJA	Paronychia jamesii
Spiny haplopappus	HASP	Haplopappus spinulosis	Desert holly	PENA	Perezia nana
Bluet	HEDY	Hedyotis sp.	Penstemon	PENST	Penstemon sp.
Annual sunflower	HELIA	Helianthus sp.	Camote del Monte	PESC3	Peteria scoparia
Hoffmanseggia	HOFFM	Hoffmanseggia sp.	Blue Curls	PHACE	Phacelia sp.
Bitterweed	HYOD	Hymenoxys odorata	Plantain	PLANT	Plantago sp.
Stemmed bitterweed	HYSC2	Hymenoxys scaposa	White milkwort	POAL4	Polygala alba
Woolly white	HYFL	Hymenopappus flavescens	Paperflower	PSILO4	Psilostrophe sp.
Ipomopsis	IPLO	Ipomopsis longiflora	Russian-thistle	SAKA	Salsola kali
Baby white aster	LEER	Leucelene ericoides	Groundsel	SENE	Senecio sp.
Pepperweed	LEMO2	Lepidium montanum	Silverleaf nightshade	SOEL	Solanum elaeagnifolium
Pepperweed	LEPI	Lepidium sp.	Sophora	SOPHO	Sophora sp.
Bladderpod	LESQU	Lesquerella sp.	Scarlet globemallow	SPCO	Sphaeralcea coccinea
Flax	LINUM	Linum sp.	Mallow	SPHAE	Sphaeralcea sp.
Skeletonweed	LYGOD	Lygodesmia sp.	Germander	TELA	Teucrium laciniatum
Spiny aster	MAAU	Machaeranthera australis	Greenthread	THAM	Thelesperma ambiguum
Tahoka daisy	MATA2	Machaeranthera tanacetifolia	Hopitea greenthread	THME	Thelesperma megapotamieum
Menodora	MEGL	Menodora glaber	Noseburn	TRRA	Tragia ramosus
Plains blackfoot	MELE2	Melampodium leucanthum	Verbena	VERBE	Verbena sp.
Stickleaf	MENTZ	Mentzelia sp.	Annual broomweed	XADR	Xanthocephalum dracunculoides*
Four-o'clock	MIRAB	Mirabilis sp.	Rocky Mountain zinnia	ZIGR	Zinnia grandiflora
Beebalm	MONAR	Monarda sp.			

SHRUBS

Common Name	Code	Scientific name	Common Name	Code	Scientific name
Mescat acacia	ACCO2	Acacia constricta	Apache plume	FAPA	Fallugia paradoxa
Agave	AGAVE	Agave sp.	Tarbush	FLCE	Flourensia cernua*
Sand sagebrush	ARFI2	Artemisia filifolia	Ocotillo	FOSP	Fouquieria splendens
Fourwing saltbush	ATCA2	Atriplex canescens	Spiny allthorn	KOSP	Koeberlinia spinosa
Yerba-de-pasmo	BAPT	Baccharis pteronioides	Range ratany	KRPA	Krameria parvifolia
Red barberry	BEHA	Berberis haematocarpa	Creosotebush	LATR	Larrea tridentata
Algerita	BETR2	Berberis trifoliolata	Catclaw mimosa	MIBI3	Mimosa biuncifera
Brickellbush	BRICK	Brickellia sp.	Sacahiusta	NOTE	Nolina texana
Desert ceanothus	CEGR	Ceanothus greggii	Prickly pear	OPUN	Opuntia sp.
Winterfat	CELA	Ceratoides Lanata	Cholla	OPIM	Opuntia imbricata
Mountain mahogany	CEMO	Cercocarpus montanus	Mariola	PAAR	Parthenium argentatum
Southwest rabbitbrush	CHPU4	Chrysothamnus pulchellus	Mariola	PAIN	Parthenium incanum
Winterfat	CELA	Ceratoides hanata	Honey mesquite	PRGL	Prosocis glandulosa
Gray coldenia	COHI	Coldenia hispidissima	Skunkbush	RHAR	Rhus aromatica
Coldenia	COCA	Coldenia canescens	Littleleaf sumac	RHMI3	Rhus microphylla
Broom dalea	DASC2	Dalea scoparia	Star rose	ROST	Rosa stellata
Sotol	DASY	Dasylirion sp.	Goldeneye	VIST	Viguiera stenoloba
Feather dalea	DAFO	Dalea formosa	Broom snakeweed	XASA	Xanthocephalum sarothrae*
Morman tea	EPHE	Ephedra spp.	Banana yucca	YUBA	Yucca baccata
			Soaptree yucca	YUEL	Yucca elata
			Torrey yucca	YUTO	Yucca torreyi
			Javelina bush	ZIER	Zizyphus ericoides*
			Lotebush	ZIOB	Zizyphus obtusifolia*

TREES

Common Name	Code	Scientific name	Common Name	Code	Scientific name
Desert willow	CHLI2	Chilopsis linearis	Pinyon	PIED	Pinus edulis
Alligator juniper	JUDE2	Juniperus deppeana	Wavyleaf oak	QUUN	Quercus undulata
Oneseed juniper	JUMO	Juniperus monosperma	Gray oak	QUGR3	Quercus grisea
Juniper	JUNI	Juniperus sp.	Salt cedar	TAMA	Tamarix sp.

TABLE C-2. HERBAGE YIELDS BY PLANT COMMUNITY.

Data are based on 1979 clipping data obtained for this EIS, and represent the estimated annual production (in pounds) of all grasses, forbs and shrubs which were collected, except unpalatable species such as broom snakeweed, creosotebush, cholla and desert baileya. Forage yields are 50 percent of herbage yields, based on 50 percent proper utilization of key species (see p. A-15).

Plant Community No. and Name		Measured Yield	Adjusted Yield; basis
1.	Stne-Bocu	722	
2.	Yuel-Himu	1247	Reduced to 1122 to take into account previous year's growth on tobosa
3.	Yuba-Xasa-Boer	698	
4.	Boer-Bogr	790	
5.	Note-Stne	515	
6.	Xasa-Bogr	668	
7.	Xasa-Bocu-Boer	480	
8.	Opim-Himu-Bout	1425	Reduced to 1354 to take into account previous year's growth on tobosa
9.	Scbr-Himu	409	
10.	Spai	1213	
11.	Coni-Oyac-Erpu	432	Eliminated from AUM calculations due to undesirability as cattle forage
12.	Latr-Xasa-Bogr	472	
13.	Latr-Scbr	454	Reduced to 150 lbs/acre/year north of Highway 506 due to lower productivity on stony soils
14.	Latr-Flce-Scbr	610	Adjusted to 400 to reflect heavier-than-normal rainfall prior to study.
15.	Prgl-Xasa-Spfl	590	Adjusted to 350 to reflect fragile nature of community; and heavier-than-normal rainfall prior to study
16.	Latr-Paar-Erpu	158	
17.	Fapa-Bogr	1697	For purposes of AUM calculations, only 50% of the unit is considered suitable for grazing when the proposed action is implemented (compared to 25% suitability at present). Represents 5% of the area mapped as a complex of 17, 18 and 19 and 5% of the area mapped as 17, 20 and 21.
18.	Vist-Muse	741	50% suitability (see 17). Represents 47.5 percent of the area mapped as a complex of 17, 18 and 19. The yield of the complex was 729 pounds/acre/year.
19.	Vist-Paar-Bocu	615	50% suitability (see 17). Represents 47.5 percent of the area mapped as a complex of 17, 18 and 19. The yield of the complex was 729 pounds/acre/year.
20.	Cemo-Muse-Bogr	730	50% suitability (see 17). Represents 47.5 percent of the area mapped as a complex of 17, 20, and 21. The yield of the complex 8 was 816 pounds/acre/year.
21.	Juni-Quun-Bocu	810	50% suitability (see 17). Represents 47.5 percent of the area mapped as a complex of 17, 20 and 21. The yield of the complex was 816 pounds/acre/year.
22.	Pj-Cemo-Muse	620	50% suitability (see 17).

UTILIZATION

To assist in the evaluation of changes in livestock distribution which would result from the proposed action, utilization was estimated for a hypothetical water supply on the Mesa. For present conditions it was assumed that cattle were restricted to two miles from water, overall utilization was light, and the level of utilization declined 20% per mile, from very heavy at the water to zero at distances beyond two miles. For future conditions it was assumed that cattle would be restricted to 1.5 miles from the water (beyond which they would move to another supply), overall utilization would be moderate; and utilization would decline 10% per mile. All assumptions are consistent with field data and literature findings discussed in Chapter 2 and 3 of the EIS. These assumptions lead to the following quantification of animal distribution and forage utilization patterns:

Distance (miles) from water	Area (sq. miles)	Utilization Existing (percent)	Utilization Proposed Action (percent)
0-0.5	0.79	60	57.5
.5-1.0	2.35	45	52.5
1.0-1.5	3.93	35	47.5
1.5-2.0	5.50	25	-

For existing conditions, utilization averages 34% in an area of 12.6 sq. miles. For the proposed action, it would average 50% in an area of 7.1 sq. miles.

Table 3-4 projects the acreages in different utilization classes in each pasture, once the proposed action is fully implemented. Preparation of the Table involved the following steps. First, fifty percent of the area in the Mountain Foothills and Canyonlands would have a slight level of utilization, because it would be rated unsuitable for livestock grazing. Second, the creosotebush vegetation in Pasture 7 would be subject to light utilization due to limited forage values. Similarly, the gyp range site in Pasture 1 would be subject to slight utilization, due to limited forage values.

The third step was to assume that in the remainder of the fourteen pastures, utilization would average 50 percent. See p. A-15 for a discussion of possible errors associated with this assumption. Fourth, twenty-five acres near each new or existing water facility would be subject to heavy utilization, except in the Mountain Foothills and Canyonlands, where the heavy use would extend to 100 acres per facility. Finally, in order to achieve the 50 percent figure overall, an acreage equal to that determined by step four would be expected to be lightly grazed. This represents areas near pasture boundaries.

PROJECTED LIVESTOCK AUMS AND HERBAGE YIELDS

Table 3-3 contains estimates of livestock AUMs which would be utilized if the proposed action were implemented, and the sustained yield of herbage which would be expected from that utilization. Procedures used to develop the table were as follows.

Column 1. Pasture. Lists the number and name of the fourteen pastures in which grazing would occur. All grazing would be limited to a nine-month season (September-June).

Column 2. Acres. Acres within each pasture.

Column 3. Existing Herbage Yields. Existing forage production, in pounds per acre per year. The estimate is based on forage yields measured in 1979, as adjusted to reflect the probable long-term yields. For example, in Pasture 3, vegetation community 13 (Latr-Scbr) covers 7,919 acres (Table 2-2), and has a long-term yield of 150 pounds per acre per year (Table C-2). Total yield is thus (7919 x 150 =) 1,187,850 pounds per year. Similar calculations can be made for vegetation communities 15, 16, and 19. The total yield from the four communities in the pasture is 13,861,606 pounds per year, or 433.18 pounds per acre per year. This is rounded to 433 in Table 3-3. Yield figures for both Pastures 1 and 2 (387 and 455 pounds per acre per year, respectively) were judged by the EIS team as being greater than the yield over the long term, and were reduced to more representative values in Table 3-3.

Column 4. Existing AUMs. AUMs available for livestock, deer, antelope, and other wildlife under existing conditions. Annual forage production in each pasture was calculated by multiplying yield (column 3) by acres (column 2). This total production was then divided by 2, to estimate the forage available from 50 percent utilization of forage resources. The resulting value was next divided by 1000, as each AUM was estimated to be associated with the disappearance of 1000 pounds of the available forage. For example, in Pasture 3:

$$\frac{433 \times 32{,}000}{2 \times 1000} = 6928$$

There are two major assumptions involved in this calculation. First, a management program to provide for 50 percent utilization of key forage species will result in an utilization of the overall forage resource which is less than 50 percent. Although data on the actual value of utilization are not available, the key species are a large part of the forage resource. Fifty percent utilization of these species would likely result in at least 40-45 percent utilization of all forage. The overestimate of utilization caused by assuming 50 percent use of all forage would be offset, at least in part, by the fact that the yield figures given in column 3 are generally conservative. For example the yields do not reflect the production (regrowth) stimulated by grazing. The second assumption, below, also mitigates any overestimate caused by this first assumption.

Second, the value of 1000 pounds per AUM is higher than used in many grazing programs. The value was selected because of recent studies which suggest that values of 700 to 800 pounds per AUM may underestimate the amount of forage needed to sustain an AUM. The value was also selected to ensure that the estimates given in Table 3-3 are conservative. The conservative approach is needed because the Table shows that the proposed program will substantially increase AUMs. It is important to ensure that benefits of the proposed action are not overstated, which might occur if a value of 700 to 800 pounds per AUM were used to estimate probable stocking rates and industry benefits. (Note that actual AUMs from the proposed action will be determined by monitoring, and are in no way affected by either of the assumptions described here. Table 3-3 does not represent an allocation of forage, but only an approximation of the probable impact of the proposed action.) The estimated forage use per AUM of 1000 pounds includes 750 pounds consumed by an average adult cow, and 250 pounds which is trampled, contaminated by manure and urine, grazed by insects, detached and blown away, or otherwise utilized. The value of 1000 pounds per AUM reflects the literature (e.g. Schneider et. al., 1955; Cordova et. al., 1978; McCawley and Dahl, in press). This literature indicates that in a feedlot environment, the actual food used by an adult cow averages 750 pounds per month. However, in field conditions a measurement of forage before and after grazing shows a loss of forage from 900 to 1300 pounds per AUM.

Column 5. Existing Wildlife AUMs. These AUMs are presently utilized by deer, antelope, rabbits, and small herbivorous mammals. BLM provided estimates of existing summer and winter deer and antelope populations per section for each natural unit (see Figure 2-8). These estimates were converted into total number of deer and antelope months per pasture by calculating summer and winter animal months for each natural unit, and summarizing the results for all natural units within a pasture (see Table 2-10).

Pasture 3 deer population: summer, fall, spring (9 months)

Alluvial Fans:	18,000 acres @ 20 deer/section =	563 deer
Canyonlands:	13,000 acres @ 31 deer/section =	630 deer
Rimlands:	1,000 acres @ 8 deer/section =	13 deer
		1206 deer x 9 mo. = 10,854 deer-months

Deer Population: Winter (3 months)

31,000 acres @ 40 deer/section = 1938 deer x 3 mo. = 5,814 deer-months

AUMs were then computed by dividing the total number of deer and antelope months per pasture by the number of deer and antelope equivalent to one cow (17 and 19, respectively). Pasture 3 has no antelope AUMs.

Pasture 3 deer AUMs

Total no. of deer-months:	10,854 + 5,814 = 16,668
@ 17 deer-months per AUM:	16,668/17 = 980 deer AUMs

For small mammals and rabbits, AUMs were calculated by taking biomass values from Table 2-10b, and converting to AUM equivalents. The calculation for Pasture 3 (which has no antelope) is:

total biomass of small mammals =	16,731 pounds
animal unit equivalents @ 1000 pounds per animal unit =	16.731 animal units
AUMs: 16.731 x 12 months =	201 other wildlife AUMs

Column 6. Existing Livestock AUMs. Actual livestock utilization under present conditions. Based on 1970-1979 records (see Appendix G), except the value for Pasture 2, which is based on projected utilization when the unit is opened for grazing in 1981.

Column 7. Projected Herbage Yields. Projected forage production, pounds per acre per year. To estimate this production, an iterative process was used. As described in Chapter 3, the proposed action could cause a 10% decline in forage production for the grazed area as a hole. It is assumed that the decline would exceed this percentage in pastures which are now lightly grazed, and which would be most changed by increased grazing. Conversely, there would be no decline in yield in pastures which are now moderately grazed, and which would be little changed by the proposed action. Initially the AUMs shown in column 4 were used as the estimate of future conditions. Then those pastures which are now moderately grazed (such as 12) were assumed to experience no increase in use or decrease in productivity. Those pastures which are lightly grazed (such as 9) were expected to experience an increase in utilization, and a decrease in productivity. The decreased yield was assumed to be greatest in Pastures which would experience the greatest increase in utilization. The estimates for individual pastures were adjusted until the net effect in all fourteen pastures was a reduction in productivity of 10 percent.

This calculation was complicated in Pastures 3, 4, 5, 7 and 8 because these units contain vegetation communities 17, 18, 19, 20, 21 and 22, which occur in upland areas. After the proposed action is implemented, only 50 percent of the acreage in each community would be rated as suitable for grazing. The other half of the acres in these communities would experience no increase in utilization, and no decrease in productivity.

The productivity-decrease values finally utilized in Table 3-3 were as follows.

Pasture 1. 25 percent reduction, compared to existing conditions.
Pasture 2. 30 percent.
Pasture 3. 10 percent, except vegetation unit 19, 5 percent.
Pasture 4. 5 percent (all vegetation units are upland types).
Pasture 5. 10 percent (all vegetation units are upland types).
Pasture 7. 5 percent except vegetation unit 18, no change.
Pasture 8. 10 percent except vegetation unit 19, 5 percent.
Pasture 9. 10 percent.
Pasture 10. No change.
Pasture 11. No change.
Pasture 12. No change.

Pasture 13. 15 percent.
Pasture 14. 10 percent.
Pasture 15. 20 percent.

A sample calculation for Pasture 3 follows.

Total production (existing): 13,861,606 pounds per year of which 9,700,074 pounds occur in vegetation community 19, and 4,161,532 pounds occur in communities 13, 15 and 16.

4,161,532 pounds/year minus 10% reduction in production = 3,745,379
9,700,074 pounds/year minus 5% reduction in production = 9,215,070
Total = 12,960,449

$$\frac{12{,}960{,}449 \text{ pounds per year}}{32{,}000 \text{ acres}} = 405 \text{ pounds/year average yield}$$

Column 8. Projected AUMs available. Calculated as for column 4, except that projected herbage yields were used in place of existing yields. For Pasture 3:

$$\frac{405 \times 32{,}000}{2 \times 1000} = 6{,}480 \text{ AUMs per/year}$$

Column 9. Projected deer AUMs. Determined as for column 4, except that projected deer populations (see Chapter 3) were used instead of existing populations. For Pasture 3 (summer and winter):

Alluvial Fans:	18,000 acres @ 25 deer/sec. =	703 deer
Canyonlands:	13,000 acres @ 40 deer/sec. =	813 deer
Rimlands:	1,000 acres @ 10 deer/sec. =	16 deer
		1532 deer

$$\frac{1532 \times 12}{17} = 1081 \text{ AUMs per year.}$$

Column 10. Projected antelope AUMs. Determined as for column 4, except that projected antelope populations (Table 3-6) were used instead of existing populations. No example is given for Pasture 3, as this unit contains no antelope. The calculation for Pasture 9 is:

31,000 acres @ 4 antelope/section = 194 antelope

$$\frac{194 \times 12}{19} = 123 \text{ AUMs per year.}$$

Column 11. Projected AUMs left for other wildlife. For Pastures 1, 2, and 9-15, the biomass of existing rabbit and small mammal populations was taken from Table 2-10 of the text. This biomass was converted into AUM equivalents (as shown below), and the value used in Table 3-3. For example, in Pasture 9:

biomass of small mammals = 16,760 pounds, of which 2,422 pounds is deer, and 7,992 pounds is antelope, leaving 6,346 pounds as small mammals and rabbits

$$\frac{6,346 \times 12}{1000} = 219 \text{ wildlife AUMs (exclusive of deer, antelope)}$$

Estimates for Pastures 3, 4, 5, 7 and 8 were developed by assuming that cattle would not graze in the 50 percent of the upland areas rated unsuitable for livestock. (This assumption yields a conservative estimate of cattle AUMs.) Forage in the unsuitable areas was assumed to be available for deer and small mammals. Forage not required for deer (column 9) was converted to AUM equivalents (at 50 percent utilization, 1000 pounds per AUM), and the resulting number given in this column. In general the AUMs are much greater than observed at present, and are unlikely to be reached under any alternative.

A sample calculation for Pasture 3 follows.

Vegetative Communtity 19:

Available herbage:	9,700,074 lbs.	
less 5 percent reduction	- 485,004	
	9,215,070	projected forage production
of which half is on land rated as unsuitable for livestock	x 50%	
	4,607,535	forage available for wildife

$$\frac{4,607,535}{2 \times 1000} = 2,194 \text{ AUMs}$$

2,194 AUMs - 1,081 deer AUMs = 1,113 AUMS available for other wildlife.

Column 12. Projected cattle AUMs. Equal to the projected AUMs (column 8) minus the sum of projected deer, antelope and other wildlife AUMs (columns 9, 10 and 11). For Pasture 3:

(Projected AUMs)	6,171	total AUMs in pasture
	-1,081	projected deer AUMs
	- 0	projected antelope AUMs
	-1,113	projected wildlife AUMs
	3,977	projected cattle AUMs

Column 13. Projected change in cattle AUMs. Column 12 minus column 6.

Example for Pasture 3:

3,977	projected cattle AUMs
- 2,752	existing cattle AUMs
1,225	change in cattle AUMs

APPENDIX D: SOILS

TABLE D-1. APPLICATION OF WIND EROSION EQUATION.

	Existing Condition, Entire Co-use Area									Proposed Action, Existing Pastures				
	I	K	C	L	IKCL	V	Erosion (tons/acre year)	Acres	Total Erosion (million tons/year)	V	Erosion (tons/acre/ year)	Increased Erosion (tons/acre/ year)	Acres	Total Increase (million tons/year)
Natural Unit														
Mountain Foothills	0*	-	-	-	-	-	0		-	-	-	-	-	0
Canyonlands	0*	-	-	-	-	-	0		-	-	-	-	-	0
Mesa	86	0.75	2.0	.0	129	5,000	20	110,000	2.20	4,500	23	3	110,000	0.33
Rimlands	0*	-	-	-	-	-	0		-	-	-	-	-	0
Alluvial Fans	48	0.75	2.0	1.0	72	3,200	23	179,000	4.18	2,900	28	5	61,000	0.31
Bolson	134	0.75	2.0	1.0	201	2,000	140	109,000	15.26	1,600	160	20	45,000	0.90
									21.64					1.54

* No further entries made.

I = soil erodibility index; K = surface roughness; C = climate; L = field length; V = vegetative cover.

Source: Allen and Anderson (1980).

TABLE D-2. SEDIMENT YIELD EVALUATION ON PASTURES 1 THROUGH 15, USING THE PSIAC METHOD.

afsmy = acre feet per square mile per year.

Natural Unit	and Soil	Surface Geology	Soils	Climate	Runoff	Topo-graphy	Ground Cover	Land Use (Before)	Land Use (After)	Upland Erosion	Channel Erosion & Sediment Transport	Sediment Yield by Natural Unit (afsmy) before	Sediment Yield by Natural Unit (afsmy) after	Total Increase (afsmy)
Mountain Foothill:	Ector	2	2	8	8	15	-6	-2	1.5	14	13	0.47	0.53	0.06
	Rock Outcrop		no sediment yield according to SCS-Albuquerque (Oran Bailey)											
	Deama	5	5	8	8	18	-4	-2	1.5	18	20			
	Lozier	3	3	8	7	13	-6	-2	1.5	13	11			
Canyon-lands:	Rock Outcrop		no sediment yield according to SCS-Albuquerque (Oran Bailey)									0.32	0.38	0.06
	Ector	2	2	8	8	15	-6	-3	1.5	14	13			
	Lozier	3	3	8	7	13	-6	-3	1.5	13	11			
	Nickel	4	4	8	8	8	-2	-3	1.5	17	18			
	Tencee	4	4	8	8	7	+1	-3	1.5	15	16			
Mesa:	Philder	0	7	6	5	3	+2	-2	1.5	9	11	0.37	0.42	0.05
	Armesa	0	8	6	5	2	+5	-2	1.5	12	11			
	Lozier	3	3	6	6	10	-6	-2	1.5	9	11			
	Reyab	0	5	6	5	1	+6	-2	1.5	14	5			
	Rock Outcrop		no sediment yield according to SCS-Albuquerque (Oran Bailey)											
	Nickel	4	4	6	7	8	-2	-2	1.5	15	17			
	Tencee	4	4	6	7	7	+1	-2	1.5	14	14			
Rimlands:			negligible acreage or sediment yield											
Alluvial Fans:	Nickel	4	4	7	8	8	-2	-4	1.5	15	17	0.45	0.55	0.10
	Armesa	0	8	7	6	2	+5	-4	1.5	12	11			
	Philder	0	6	7	7	4	+2	-4	1.5	9	11			
	Tome	0	9	6	3	1	+7	-4	1.5	20	2			
	Tencee	4	4	7	8	7	+1	-4	1.5	14	14			
	Lozier	3	3	7	7	10	-6	-4	1.5	9	11			
	Mimbres	0	8	6	4	1	+7	-4	1.5	18	3			
	Rock Outcrop		no sediment yield according to SCS-Albuquerque (Oran Bailey)											
Bolson:	Tome	0	9	5	2	1	+7	-5	1.5	18	2	0.29	0.37	0.08
	Pintura	0	7	5	3	2	+5	-5	1.5	16	0			
	Dona Ana	0	7	5	3	0	+8	-5	1.5	14	3			
	Mimbres	0	8	5	3	0	+7	-5	1.5	13	3			
	Holloman	0	5	5	3	0	+8	-5	1.5	13	0			

Source: Allen and Anderson (1980).

APPENDIX E: WATER

The Soil Conservation Service method for estimating flood flow is based on empirical relations between various watershed parameters and peak flow rates. Watershed characteristics are used with combined statistical and graphical techniques to determine the amount and peak rate of runoff. The procedure has been found to overestimate peak flows; however, when consistently applied it has been responsive to relatively small changes in vegetative cover (Engineering Field Manual, 1973; BLM District Files).

The SCS methodology was applied to model one square mile watersheds in each natural unit within the Co-use area. No one of these watersheds is likely to be found on the Range exactly as it is presented here. Rather, the models should be considered as representative watersheds for which typical values are used. Table E-1 gives the values which were input to the procedure, and the flood flows (peak and total) which were calculated for existing conditions, and for various projected conditions which would occur under alternative grazing management programs. Refer to a support document for additional information (Jenkins and McGough, 1980).

TABLE E-1. MAGNITUDE OF FLOOD RUNOFF EVENTS IN CO-USE AREA.

All calculations are for a hypothetical basin of one square mile. cfs = cubic feet per second. ONC = distribution curve number. TC = time of concentration. CN = runoff curve number, based on soil value (runoff rating in letters from A (slow runoff) to D (fast runoff)), cover. E = the CN under existing conditions. O = the CN under alternatives which would cause a substantial decrease in plant cover. I = the CN under alternatives which would cause range cover to substantially increase in the future. P2, P10 etc. are values of precipitation for a recurrance interval of 2, 10 etc. years a/. Q2, Q10 etc. are values of discharge for a recurrance interval of 2, 10 etc. years a/.

Natural unit	Length (ft.)	soil	cover	ONC		CN	24-hour rainfall, inches P2	P10	P50	P100	Slope %	TC	Peak discharge, cfs Q2	Q10	Q50	Q100	Total discharge, acre feet Q2	Q10	Q50	Q100
Mountain Foothills	5,280	D	mt. brush, fair	65	E	84	2.2	3.4	4.6	5.0	20.0	0.12	737	1515	2376	2703	48	99	155	176
					O	83							680	1434	2253	2621	44	93	147	171
					I	85							778	1556	2458	2785	51	101	160	181
Canyonlands	5,280	D	mt. brush, fair	65	E	84	1.6	2.7	3.6	4.4	12.3	0.21	384	960	1536	2074	27	67	107	144
					O	83							346	922	1498	2035	24	64	104	141
					I	85							407	1021	1613	2150	28	71	112	149
Mesa	9,814	C	herbaceous, fair	75	E	79	1.7	2.7	3.6	4.4	2.0	0.68	217	577	972	1354	20	52	88	123
					O	78							206	548	942	1313	19	50	85	119
					I	80							230	606	1001	1384	21	55	91	125
Rimland	5,280	D	mt. brush, fair	75	E	84	1.6	2.7	3.6	4.4	4.3	0.31	416	1040	1664	2246	27	67	107	144
					O	83							374	998	1622	2205	24	64	104	141
					I	85							441	1107	1747	2330	28	71	112	149
Alluvial Fans	8,448	B	desert brush, poor	75	E	83	1.6	2.7	3.6	4.4	3.2	0.50	308	822	1301	1815	24	64	101	141
					O	82							274	788	1233	1746	21	61	96	136
					I	84							342	856	1370	1883	27	67	107	147
Bolson	5,280	B	desert brush, poor	75	E	83	1.6	2.6	3.5	4.2	.9	0.57	291	743	1196	1583	24	61	99	131
					O	82							259	711	1164	1519	21	59	96	125
					I	84							323	776	1228	1648	27	64	101	136

a. The concept of recurrence interval is statistical and does not imply that floods of the indicated size will occur at regular intervals.

Source: Jenkins and McGough (1980);

APPENDIX F: WILDLIFE

TABLE F-1. VERTEBRATES OF MCGREGOR RANGE.

Species listed in phylogenetic order. * designates species observed during summer field season, 1979

Mammals

Didelphis marsupialis (Opossum)
Notiosorex crawfordi (Desert shrew)
Myotis velifer (Cave myotis)
Myotis yumanensis (Yuma myotis)
Myotis lucifugus (Little brown myotis)

Myotis thysanodes (Fringed myotis)*
Myotis volans (Long-legged myotis)
Myotis californicus (California myotis)*
Myotis leibii (Small-footed myotis)
Lasionycteris noctivagans (Silver-haired bat)

Pipistrellus hesperus (Western pipistrelle)
Eptesicus fuscus (Big brown bat)
Euderma maculatum (Spotted bat)
Plecotus townsendii (Western big-eared bat)
Antrozous pallidus (Pallid bat)

Tadarida brasiliensis (Mexican freetail bat)
Tadarida macrotis (Big freetail bat)
Sylvilagus auduboni (Desert cottontail)*
Lepus californicus (Blacktail jackrabbit)*
Eutamias canipes (Grayfoot chipmunk)*

Spermophilus spilosoma (Spotted ground squirrel)*
Spermophilus variegatus (Rock squirrel)*
Cynomys ludovicianus (Blacktail prairie dog)
Thomomys bottae (Valley pocket gopher)
Paopogeomys castanops (Mexican Yellow-faced pocket gopher)*

Perognathus flavus (Silky pocket mouse)*
Perognathus flavescens (Plains pocket mouse)
Perognathus hispidus (Hispid pocket mouse)
Perognathus intermedius (Rock pocket mouse)*
Perognathus penicillatus (Desert pocket mouse)*

Dipodomys ordii (Ord's kangaroo rat)*
Dipodomys spectabilis (Bannertail kangaroo rat)*
Dipodomys merriami (Merriam's kangaroo rat)*
Reithrodontomys montanus (Plains harvest mouse)
Reithrodontomys megalotis (Western harvest mouse)*

Peromyscus eremicus (Cactus mouse)*
Peromyscus maniculatus (Deer mouse)*
Peromyscus leucopus (White-footed mouse)*
Peromyscus boylii (Brush mouse)*
Peromyscus truei (Pinyon mouse)*

Peromyscus difficilis (Rock mouse)*
Onychomys leucogaster (Northern grasshopper mouse)*
Onychomys arenicola (Southern grasshopper mouse)*
Sigmodon hispidus (Hispid cotton rat)*
Neotoma micropus (Southern plains woodrat)*

Neotoma albigula (White-throated woodrat)*
Neotoma mexicana (Mexican woodrat)
Microtus mexicanus (Mexican vole)*
Mus musculus (House mouse)
Erethizon dorsatum (Porcupine)*

Canis latrans (Coyote)*
Canis lupus (Gray wolf)
Vulpes macrotis (Kit fox)
Urocyon cinereoargenteus (Gray fox)
Ursus americanus (Black bear)

Bassariscus astutus (Ringtail)
Procyon lotor (Raccoon)
Mustela frenata (Long-tailed weasel)
Taxidea taxus (Badger)
Spilogale gracilis (Western spotted skunk)

Mephitis mephitis (Striped skunk)
Conepatus mesoleucus (Hognose skunk)
Felis concolor (Mountain lion)*
Lynx rufus (Bobcat)
Cervus elaphus (Elk)

Odocoileus hemionus (Mule deer)*
Odocoileus virginianus (Whitetail deer)
Antilocapra americana (Pronghorn antelope)*

Bos (Cattle)

Birds

Podiceps auritus (Horned grebe)
Podiceps caspicus (Eared Grebe)
Aechmophorus occidentalis (Western grebe)
Podilymbus podiceps (Pied-billed grebe)
Ardea herodias (Great blue heron)

Butorides virescens (Green heron)
Casmerodius albus (Common egret)
Leucophoyx thula (Snowy egret)
Nyticorax nyticorax (Black-crowned night heron)
Ixobrychus exilis (Least bittern)

Ereunetes mauri (Western sandpiper)
Crocethia alba (Sanderling)
Recurvirostra americana (American avocet)
Himantopus mexicanus (Black-necked stilt)
Steganopus tricolor (Wilson's phalarope)

Larus delawarensis (Ring-billed gull)
Larus pipixcan (Franklin's gull)
Larus philadelphia (Bonaparte's gull)
Sterna forsteri (Forster's tern)
Sterna albifrons (Least tern)

TABLE F-1. CONTINUED.

Botaurus lentiginosus (American bittern)
Plegadis chini (White-faced ibis)
Branta canadensis (Canada goose)
Chen hyperborea (Snow goose)
Dendrocygna bicolor (Fulvous tree duck)

Anas platyrhynchos (Mallard)*
Anas diazi (Mexican duck)
Anas strepera (Gadwall)
Anas acuta (Pintail)
Anas carolinensis (Green-winged teal)

Anas discors (Blue-winged teal)*
Anas cyanoptera (Cinnamon teal)
Mareca americana (American widgeon)
Spatula clypeata (Shoveler)
Aix sponsa (Wood duck)

Aythya americana (Redhead)
Aythya collaris (Ring-necked duck)
Aythya valisineria (Canvasback)
Aythya affinis (Lesser scaup)
Bucephala albeola (Bufflehead)

Oxyura jamaicensis (Ruddy duck)
Lophodytes cucullatus (Hooded merganser)
Mergus merganser (Common merganser)
Cathartes aura (Turkey vulture)*
Coragyps atratus (Black vulture)

Accipiter striatus (Sharp-shinned hawk)
Accipiter cooperii (Cooper's hawk)
Buteo jamaicensis (Red-tailed hawk)*
Buteo lineatus (Red-shouldered hawk)
Buteo swainsoni (Swainson's hawk)*

Buteo lagopus (Rough-legged hawk)
Buteo regalis (Ferruginous hawk)
Parabuteo unicinctus (Harris' hawk)*
Buteogallus anthracinus (Black hawk)
Aquila chrysaetos (Golden eagle)*

Haliaeetus leucocephalus (Bald eagle)
Circus cyaneus (Marsh hawk)*
Pandion haliaetus (Osprey)
Falco mexicanus (Prairie falcon)
Falco peregrinus (Peregrine falcon)

Falco femoralis (Aplomado falcon)
Falco sparverius (Kestrel)*
Callipepla squamata (Scaled quail)*
Lophortyx gambelii (Gambel's quail)*
Cyrtonyx montezumae (Harlequin quail)

Meleagris gallopavo (Turkey)
Grus canadensis (Sandhill crane)
Rallus limicola (Virginia rail)
Porzana carolina (Sora)
Gallinula chloropus (Common gallinule)

Fulica americana (American coot)
Charadrius vociferus (Killdeer)*
Eupoda montana (Mountain plover)
Squatarola squatarola (Black-bellied plover)
Capella gallinago (Common snipe)

Numenius americanus (Long-billed curlew)
Bartramia longicauda (Upland plover)
Actitis macularia (Spotted sandpiper)
Tringa solitaria (Solitary sandpiper)
Catoptrophorus semipalmatus (Willet)*

Totanus melanoleucus (Greater yellowlegs)
Totanus flavipes (Lesser yellowlegs)*
Erolia bairdii (Baird's sandpiper)
Erolia minutilla (Least sandpiper)
Limnodromus scolopaceus (Long-billed dowitcher)

Chlidonias niger (Black tern)
Columba fasciata (Band-tailed pigeon)
Columba livia (Rock dove)
Zenaida asiatica (White-winged dove)*
Zenaidura macroura (Mourning dove)*

Columbigallina passerina (Ground dove)
Scardafella inca (Inca dove)
Coccyzus americanus (Yellow-billed cuckoo)
Geococcyx californianus (Roadrunner)*
Tyto alba (Barn owl)

Otus asio (Screech owl)
Otus flammeolus (Flammulated owl)
Bubo virginianus (Great horned owl)*
Speotyto cunicularia (Burrowing owl)*
Asio otus (Long-eared owl)

Asio flammeus (Short-eared owl)
Aegolius acadicus (Saw-whet owl)
Caprimulgus vociferus (Whip-poor-will)
Phalaenoptilus nuttallii (Poor-will)*
Chordeiles minor (Common nighthawk)*

Chordeiles acutipennis (Lesser nighthawk)*
Aeronautes saxatalis (White-throated swift)
Archilochus alexandri (Black-chinned hummingbird)*
Selasphorus platycercus (Broad-tailed hummingbird)*
Selasphorus rufus (Rufous hummingbird)*

Megaceryle alcyon (Belted kingfisher)
Colaptes cafer (Red-shafted flicker)*
Melanerpes formicivorus (Acorn woodpecker)
Asyndesmus lewis (Lewis' woodpecker)
Sphyrapicus varius (Yellow-bellied sapsucker)

Sphyrapicus thyroideus (Williamson's sapsucker)
Dendrocopos villosus (Hairy woodpecker)
Dendrocopos pubescens (Downy woodpecker)
Dendrocopos scalaris (Ladder-backed woodpecker)
Tyrannus verticalis (Western kingbird)*

Tyrannus vociferans (Cassin's kingbird)*
Muscivora forficata (Scissor-tailed flycatcher)
Myiarchus tyrannulus (Wied's crested flycatcher)
Myiarchus cinerascens (Ash-throated flycatcher)*
Sayornis nigricans (Black phoebe)

Sayornis saya (Say's phoebe)*
Empidonax oberholseri (Dusky flycatcher)
Empidonax wrightii (Gray flycatcher)
Empidonax difficilis (Western flycatcher)
Contopus sordidulus (Western wood peewee)

Nuttallornis borealis (Olive-sided flycatcher)
Pyrocephalus rubinus (Vermilion flycatcher)
Eremophila alpestris (Horned lark)
Tachycineta thalassina (Violet-green swallow)*
Riparia riparia (Bank swallow)

Stelgidopteryx ruficollis (Rough-winged swallow)
Petrochelidon pyrrhonota (Cliff swallow)*
Progne subis (Purple martin)
Cyanocitta stelleri (Steller's jay)*
Aphelocoma coerulescens (Scrub jay)*

Aphelocoma ultramarina (Mexican jay)
Corvus corax (Common raven)*
Corvus cryptoleucus (White-necked raven)
Corvus brachyrhynchos (Common crow)
Gymnorhinus cyanocephala (Pinon jay)*

TABLE F-1. CONTINUED

Parus gambelii (Mountain chickadee)*
Parus inornatus (Plain titmouse)*
Auriparus flaviceps (Verdin)
Psaltriparus melanotis Common bushtit)*
Sitta carolinensis (White-breasted nuthatch)

Sitta canadensis (Red-breasted nuthatch)
Sitta pygmaea (Pygmy nuthatch)
Certhia familiaris (Brown creeper)
Troglodytes aedon (House wren)*
Thryomanes bewickii (Bewick's wren)*

Campylorhynchus brunneicapillum (Cactus wren)*
Telmatodytes palustris (Long-billed marsh wren)
Catherpes mexicanus (Canyon wren)*
Salpinctes obsoletus (Rock wren)*
Mimus polyglottos (Mockingbird)*

Dumetella carolinensis (Catbird)
Toxostoma rufum (Brown thrasher)
Toxostoma curvirostre (Curve-billed thrasher)*
Toxostoma dorsale (Crissal thrasher)*
Oreoscoptes montanus (Sage thrasher)

Turdus migratorius (Robin)
Hylocichla guttata (Hermit thrush)
Hylocichla ustulata (Swainson's thrush)*
Sialia sialis (Eastern bluebird)
Sialia mexicana (Western bluebird)*

Sialia currucoides (Mountain bluebird)
Myadestes townsendi (Townsend's solitaire
Polioptila caerulea (Blue-gray gnatcatcher)*
Polioptila melanura (Black-tailed gnatcatcher)
Regulus satrapa (Golden-crowned kinglet)

Regulus calendula (Ruby-crowned kinglet)*
Anthus spinoletta (Water pipit)*
Bombycilla garrula (Bohemian waxwing)
Bombycilla cedrorum (Cedar waxwing)
Phainopepla nitens (Phainopepla)

Lanius ludovicianus (Loggerhead shrike)*
Sturnus vulgaris (Starling)
Vireo bellii (Bell's vireo)
Vireo vicinior (Gray vireo)*
Vireo solitarius (Solitary vireo)

Vireo gilvus (Warbling vireo)
Vermivora celata (Orange-crowned warbler)
Vermivora virginiae (Virginia's warbler)*
Dendroica petechia (Yellow warbler)
Dendroica coronata (Yellow-rumped warbler)

Dendroica nigrescens (Black-throated gray warbler)
Dendroica townsendi (Townsend's warbler)
Dendroica graciae (Grace's warbler)
Seiurus aurocapillus (Ovenbird)
Seiurus noveboracensis (Northern waterthrush)

Oporornis tolmiei (MacGillivray's warbler)
Geothlypis trichas (Yellowthroat)
Icteria virens (Yellow-breasted chat)
Wilsonia pusilla (Wilson's warbler)*
Setophaga picta (American redstart)

Passer domesticus (House sparrow)
Sturnella magna (Eastern meadowlark)
Sturnella neglecta (Western meadowlark)*
Xanthocephalus xanthocephaus (Yellow-headedblackbird)*
Agelaius phoeniceus (Red-winged blackbird)

Icterus parisorum (Scott's oriole)*
Icterus bullockii (Bullock's oriole)*
Euphagus cyanocephalus (Brewer's blackbird)*
Cassidix mexicanus (Boat-tailed grackle)
Molothrus ater (Brown-headed cowbird)

Piranga ludoviciana (Western tanager)*
Piranga flava (Hepatic tanager)
Piranga rubra (Summer tanager)
Pyrrhuloxia sinuata (Pyrrhuloxia)
Pheucticus ludovicianus (Rose-breasted grosbeak)

Pheucticus melanocephalus (Black-headed grosbeak)*
Guiraca caerulea (Blue grosbeak)*
Passerina cyanea (Indigo bunting)
Passerina amoena (Lazuli bunting)
Passerina ciris (Painted bunting)

Spiza americana (Dickcissel)
Hesperiphona vespertina (Evening grosbeak)
Carpodacus cassinii (Cassin's finch)*
Carpodacus maxicanus (House finch)*
Spinus pinus (Pine siskin)

Spinus tristis (American goldfinch)
Spinus psaltria (Lesser goldfinch)
Chlorura chlorura (Green-tailed towhee)
Pipilo erythrophthalmus (Rufous-sided towhee)*
Pipilo fuscus (Brown towhee)*

Calamospiza melanocorys (Lark bunting)*
Passerculus sandwichensis (Savannah sparrow)
Ammodramus bairdii (Baird's sparrow)*
Pooecetes gramineus (Vesper sparrow)
Chonoestes grammacus (Lark sparrow)

Aimophila ruficeps (Rufous-crowned sparrow)*
Aimophila cassinii (Cassin's sparrow)
Amphispiza bilineata (Black-throated sparrow)*
Amphispiza belli (Sage sparrow)*
Junco hyemalis (Dark-eyed junco)

Junco caniceps (Gray-headed junco)*
Spizella passerina (Chipping sparrow)*
Spizella pallida (Clay-colored sparrow)
Spizella breweri (Brewer's sparrow)
Spizella atrogularis (Black-chinned sparrow)*

Zonotrichia querula (Harris' sparrow)
Zonotrichia leucophrys (White-crowned sparrow)*
Zonotrichia albicollis (White-throated sparrow)
Passerella iliaca (Fox sparrow)
Melospiza lincolnii (Lincoln's sparrow)

Melospiza melodia (Song sparrow)
Rhynchopanes mccowni (McCown's longspur)
Calcarius ornatus (Chestnut-collared longspur)

TABLE F-1. CONTINUED

Reptiles and Amphibians

Ambystoma tigrinum (Tiger salamander)*
Scaphiopus couchi (Couch's spadefoot toad)
Scaphiopus hammondi (Western spadefoot toad)
Scaphiopus bombifrons (Plains spadefoot toad)
Bufo woodhousei (Woodhouse's toad)

Bufo punctatus (Red-spotted toad)
Bufo cognatus (Great plains toad)*
Bufo speciosus (Texas toad)
Bufo debilis (Green toad)
Rana pipiens (Leopard frog)

Rana catesbeiana (Bullfrog)
Terrapene ornata (Western box turtle)*
Coleonyx brevis (Texas banded gecko)
Holbrookia maculata (Lesser earless lizard)*
Holbrookia texana (Greater earless lizard)*

Crotaphytus collaris (Collared lizard)*
Crotaphytus wislizenii (Leopard lizard)*
Sceloporus poinsetti (Crevice spiny lizard)*
Sceloporus magister (Desert spiny lizard)
Sceloporus undulatus (Eastern fence lizard)*

Uta stansburiana (Side-blotched lizard)*
Urosaurus ornatus (Tree lizard)*
Phrynosoma cornutum (Texas horned lizard)*
Phrynosoma douglassi (Short-horned lizard)*
Phrynosoma modestum (Round-tailed horned lizard)*

Eumeces obsoletus (Great plains skinks)
Eumeces multivargatus (Many-lined skinks)
Cnemidophorus neomexicanus (New Mexican whiptail)*
Cnemidophorus inornatus (Little striped whiptail)*
Cnemidophorus exsanguis (Chihuahua whiptail)*
Cnemidophorus tigris (Western whiptail)*

Cnemidophorus tesselatus (Checkered whiptail)*
Leptotyphlops dulcis (Texas blind snake)
Diadophis punctatus (Ringneck snake)
Heterodon nasicus (Western hognose snake)
Opheodrys vernalis (Smooth green snake)

Masticophis flagellum (Coachwhip)
Masticophis taeniatus (Striped whipsnake)
Salvadora hexalepis (Western patch-nosed snake)
Salvadora granamiae (Mountain patch-nosed snake)*
Elaphe subocularis (Trans-pecos rat snake)

Arizona elegans (Glossy snake)
Pituophis melanoleucus (Bull or gopher snake)*
Lampropeltis getulus (Common kingsnake)
Lampropeltis mexicana (Gray-banded kingsnake)*
Rhinocheilus lecontei (Long-nosed snake)

Thamnophis elegans (Western terrestrial garter snake)
Thamnophis cyrtopsis (Black-necked garter snake)
Thamnophis marcianus (Checkered garter snake)
Sonora semiannulata (Western ground snake)
Ficimia cana (Western hook-nosed snake)

Tantilla planiceps (Western black-headed snake)
Tantilla nigriceps (Plains black-headed snake)
Trimorphodon vilkinsoni (Texas lyre snake)
Hypsiglena torquata (Night snake)
Sistrurus catenatus (Massauga (pygmy) rattlesnake)

Crotalus atrox (Western diamondback rattlesnake)*
Crotalus lepidus (Rock rattlesnake)
Crotalus molossus (Black-tailed rattlesnake)*
Crotalus viridus (Prairie rattlesnake)*
Crotalus scutulatus (Mohave rattlesnake)*

Source: Smartt(1980).

TABLE F-2. COMMON VERTEBRATES OF MCGREGOR RANGE.

Includes all species observed to occur at densities more than 0.5 per hectare in any natural unit. Symbols for natural units: MF = Mountain Foothills; C = Canyonlands; M = Mesa; R = Rimlands; AF = Alluvial Fans; B = Bolson. Symbols for feeding roles: I = Insect eater; G= Grain (seed) eater; GR = Grazer; B = Browser. ND = not determined. Refer to (Smartt 1980) for data by natural unit. Population data are approximate, for entire Co-use area, during summer of 1979.

	Natural unit affinities	Approximate population size	Approximate biomass (lbs.)	Trophic role; bio-mass as % of total
BIRDS				
Gambel's quail	AF,B	28,914	9,994	G 0.054
Scaled quail	C	6,527	2,158	G 0.012
Mourning dove	M	18,384	5,471	G 0.03
Common nighthawk	MF,M,R	15,443	683	I 0.014
Red-shafted flicker	C	3,272	794	I 0.02
Western kingbird	M,AF	34,029	3,135	I 0.06
Cassin's kingbird	C,M,AF	29,479	2,590	I 0.05
Ash-throated flycatcher	MF,C	4,018	299	I 0.006
Say's phoebe	C	15,476	506	I 0.01
Horned lark	M	13,330	793	I 0.008 G 0.002
Scrub jay	MF	745	164	I 0.01 G 0.0004
Common bushtit	MF,C	36,347	734	I 0.01 G 0.0009
Rock wren	R	4,379	125	I 0.003
Mockingbird	AF	16,940	1,495	I 0.023 G 0.007
Curve-billed thrasher	C	3,080	679	I 0.01 G 0.0009
Loggerhead shrike	M,AF,B	14,780	1,767	I 0.0357
Western meadowlark	M,R,AF	31,119	3,426	I 0.05 G 0.005
Bullock's oriole	C	2,870	320	I 0.006
Brewer's blackbird	MF	13,533	1,044	I 0.02
Cassin's finch	MF,C	2,507	75	I 0.0003 G 0.0003
Rufous-sided towhee	MF,C	6,878	773	I 0.004 G 0.003
Lark bunting	M,AF	16,231	896	I 0.009 G 0.002
Black-throated sparrow	R,C,M	33,779	877	I 0.013 G 0.001
Sage sparrow	C	4,533	140	I 0.0014 G 0.0004
Chipping sparrow	MF	932	27	
Rufous-crowned sparrow 0.0690	MF	1,056	33	

TABLE F-2. (continued).

	Natural unit affinities	Approximate population size	Approximate biomass (lbs.)	Trophic role; biomass as % of total
REPTILES				
Side-blotched lizard	AF,B	107,057	ND	I ND
Lesser earless lizard	M	6,061	ND	I ND
Greater earless lizard	R	11,526	ND	I ND
Short-horned lizard	R,M	3,919	ND	I ND
Little striped whiptail	M,AF	30,368	ND	I ND
Chihuahua whiptail	C,M,R,AF	81,365	ND	I ND
Western whiptail	B	16,317	ND	I ND
MAMMALS				
Desert cottontail	MF,C,B	17,716	34,369	GR 0.065 B 0.0310
Black-tailed jackrabbit	MF,C,M,B	24,377	121,991	GR 0.2450 B 0.1101
Spotted ground squirrel	M,AF	169,073	38,039	GR 0.0152 B 0.068 I 0.3080 G 0.080
Silky pocket mouse	MF,C,M,R,AF	210,684	3,029	G 0.0200
Rock pocket mouse	C,R	65,356	1,649	I 0.0083 G 0.0070
Desert pocket mouse	AF	21,907	725	I 0.0036 G 0.0030
Ord's kangaroo rat	C,AF	816,119	89,959	G 0.8000
Merriam's kangaroo rat	M,AF,B	145,762	14,473	G 0.0800
Bannertail kangaroo rat	M,AF	26,345	6,980	G 0.0400
Western harvest mouse	MF,AF	41,454	7,503	I 0.0759 G 0.0200
Cactus mouse	R	58,245	3,185	I 0.0189 G 0.0060
Deer mouse	MF,B	44,516	1,864	I 0.0175 G 0.0050
White-footed mouse	MF,C	150,683	6,644	I 0.0184 G 0.0200
Pinon mouse	MF	20,016	1,015	I 0.0102 G 0.0030
Rock mouse	C	2,720	144	I 0.0014 G 0.0004
Northern grasshopper mouse	B,AF	341,569	19,665	I 0.1990 G 0.050
Southern grasshopper mouse	C	5,983	317	I 0.0032 G 0.0008
White-throated woodrat	C,R,AF	120,063	41,816	G 0.0800 B 0.0261 GR 0.0681
Hispid cotton rat	C,AF,MF	35,318	7,624	GR 0.0306
Mule deer	MF,C	3,040	609,841	B 0.8258 GR 0.6125
Pronghorn antelope	M	121	13,322	GR 0.0536

Source: Smartt(1980).

APPENDIX G: EXISTING GRAZING PROGRAM

TABLE G-1. SUMMARY OF GRAZING USE OF CO-USE AREA, BY PASTURE.

Pasture name, number a/	Size (acres)	Year first grazed	Grazing year when pasture was rested	Average grazing use 1970-1979 (AUMs) b/	Intensity of use 1970-1979 (AUMs/Section)	Value of grazing use, 1978-79 (dollars per AUM)
1. Langford	31,000	1968	none	2,326	48.0	$ 5.06
2. Cox Well	25,000	1981	(all)			
3. Culp	32,000	1969	1975-76	2,752	55.0	3.00
4. Lee	13,000	1969	1974-75	1,798	88.5	3.66
5. Cressgarden	20,000	1968	1973-74 1977-78	2,120	67.8	3.00
7. Rutherford	19,000	1968	none	2,585	87.1	5.11
8. Daggar	17,000	1967	1977-79	2,362	88.9	rested
9. Mesa Horse Camp	31,000	1968	none	7,490	154.6	5.77
10. Wingfield	12,000	1968	none	3,780	201.6	5.33
11. Mary Toy	18,000	1967	1976-77	4,220	150.0	4.53
12. Herd	8,000	1969	none	2,093	167.4	7.17
13. Martin Tank	20,000	1967	none	4,090	130.9	6.28
14. Antelope	12,000	1967	none	2,562	136.6	4.53
15. Shiloh	13,000	1967	none	2,304	113.4	3.39
TOTAL	271,000			40,482	95.6	$ 4.71

a. Prior to 1978 a different numbering system was used; this earlier system is not utilized in the EIS.
b. Prior to 1970, pastures 3 and 4 were grazed as single unit; pastures 5 and 7 were grazed as a single unit; pastures 13 and 15 were grazed as a single unit. Cattle and AUMs for individual pastures were estimated in proportion to acreage of the individual units within the combined pasture.

Source: BLM Las Cruces District.

TABLE G-2. SUMMARY OF GRAZING USE OF CO-USE AREA BY YEAR.

Year	Number of Units Grazed a/	Number of Units Rested	Total Acres Grazed	Number of Cattle Grazed	Total AUMS Grazed	Average Bid per AUM (Dollars)	Total Income (Dollars)
1967	2		35,000	600	3,281	1.42	4,659
1967-68	4		80,000	800	7,068	2.05	14,471
1968-69	10		193,000	2,900	27,070	1.99	53,925
1969-70	13		246,000	4,150	43,350	1.83	79,401
1970-71	13		246,000	4,400	39,600	2.05	81,337
1971-72	13		246,000	5,100	44,400	2.07	90,147
1972-73	13		246,000	5,300	42,300	2.51	106,092
1973-74	12	1	226,000	5,400	42,600	3.41	144,981
1974-75	12	1	233,000	4,850	36,700	4.39	160,965
1975-76	12	1	214,000	5,450	44,850	5.31	237,977
1976-77	12	1	228,000	4,425	37,017	5.43	201,047
1977-78	11	2	209,000	4,025	33,720	3.81	119,132
1978-79	12	1	229,000	4,775	38,330	4.73	187,305

a. The thirteen existing pastures had all been developed by the 1969-70 grazing year; pasture No.2 will be utilized begining in 1981.

Source: BLM Las Cruces District.

TABLE G-3. SUMMARY OF FORAGE CONTRACTS.

Values are AUMs leased during specific years, 1967-79.

	GRAZING UNIT (PASTURE)													
Year	1	2 a/	3	4	5	7	8	9	10	11	12	13	14	15
1967							1914			1367				
1967-68							1767			1767		1767[b]	1767	b
1968-69	2800				2800[b]	b	2800	3734	3734	3734		3734[b]	3734	b
1969-70	3600		6000[c]	c	600[b]	b	2700	7200	1800	3600	3150	4800[b]	4500	b
1970-71	1350		4500[c]	c	4500[b]	b	3600	8100	4500	3600	3150	3600[b]	2700	b
1971-72	2700		4500[c]	c	5400[b]	b	3600	8100	4500	4500	2700	5400[b]	3000	b
1972-73	2700		3600[c]	c	5400[b]	b	2700	8100	3600	4500	1800	8100[b]	1800	b
1973-74	2700		5400[c]	c	REST	3600	3200	6400	4200	5400	2100	7200[b]	2400	b
1974-75	1800		3000	REST	5400[b]	b	2800	5600	3200	4000	1500	3500	3200	2700
1975-76	2700		REST	3000	6300[b]	b	2800	8100	4050	5400	2100	5400	3200	1800
1976-77	2025		3161	3161	2430	1620	2556	7678	3240	REST	2025	4523	2632	1966
1977-78	2258		3125	2400	REST	2258	REST	7678	3333	2928	1800	4065	2083	2092
1978-79	2700		2700	2400	2880	2550	REST	7650	3400	3150	1660	4500	2040	2700
1979-80	2250		3150	4050	4050	REST	3520	7650	3080	4500	1760	5400	2200	2640

a. Pasture 2 not developed until 1981.

b. Units 13 and 15 were grazed as one unit until 1974 when a division fence was completed.
Units 5 and 7 were managed in combination until 1976.

c. Units 3 and 4 managed in combination.

Source: BLM Las Cruces District.

TABLE G-4. SUMMARY OF BIDDING, 1979-80.

Unit	Grazing Season	Number AUMs (Number Cattle)	Total Bid	Bid per AUM	Bid per Section
1	9/29 - 6/29 9 months	2250 (250)	$14,018.00	$6.23	$ 289.40
2	(Proposed - not in use)				
3	9/29 - 6/29 9 months	3150 (350)	$12,600.00	4.00	$ 252.00
4	9/29 - 6/29 9 months	4050 (450 yearlings)	$14,175.00	3.50	$ 697.85
5	9/29 - 6/29 9 months	4050 (450 yearlings)	$15,471.00	3.82	$ 495.07
7	RESTED				
8	9/29 - 6/22 8.8 months	3520 (400)	$13,446.00	3.82	$ 506.20
9	10/6 - 7/6 9 months	7650 (850)	$47,966.00	6.27	$ 990.27
10	9/29 - 6/22 8.8 months	3080 (350)	$20,051.00	6.51	$1069.39
11	10/6 - 7/6 9 months	4500 (500)	$21,735.00	4.83	$ 772.80
12	9/29 - 6/22 8.8 months	1760 (200)	$14,414.00	8.19	$1153.12
13	10/6 - 7/6 9 months	5400 (600)	$34,722.00	6.43	$1111.10
14	9/29 - 6/22 8.8 months	2200 (250)	$13,530.00	6.15	$ 721.60
15	9/29 - 6/22 8.8 months	2640 (300)	$16,130.00	6.11	$ 794.09

Total AUMs	44,250
Total cattle	4,950
Average price per AUM	$ 5.38
Average price per section	$ 562.68
Total Bid	$ 238,258.00

Source: BLM Las Cruces District.

APPENDIX H: LETTERS CITED IN EIS

FISH AND WILDLIFE SERVICE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

January 11, 1980

Date Routed:
JAN 15 1980

MEMORANDUM

TO : State Director, Bureau of Land Management, P.O. Box 1449
Santa Fe, New Mexico 87501

Acting
FROM : Regional Director, Region 2 (SE)

SUBJECT: Species List for McGregor Range Livestock Grazing Proposal

This is in reply to your December 20, 1979 letter which requested information about species which are listed or proposed to be listed as threatened or endangered as provided by the Endangered Species Act. Your area of interest is McGregor planning unit, Otero County, New Mexico.

As provided by Section 7(c) of the Endangered Species Act Amendments of 1978, the Fish and Wildlife Service is required to furnish a list of those species, both proposed and listed, that may be affected by Federal construction activities.

Upon receipt of the Fish and Wildlife Service's species list, the Federal agency authorizing, funding, or carrying out the construction action is required to conduct a biological assessment for the purpose of identifying listed species which are likely to be affected by such action. Proposed species are included on the list even though they do not have legal protection under the Act. Their inclusion recognizes that they may be listed anytime and have the portent to cause delays or modifications to the proposed action. In light of this, we recommend that those species be included in the biological assessment.

The biological assessment shall be completed within 180 days after receipt of the species list, unless it is mutually agreed to extend this period. The biological assessment should include: 1) the results of a comprehensive survey; 2) results of any studies undertaken to determine the nature and extent of any impacts on identified species; 3) considera-tion of the cumulative effects upon the species or its critical habitat;

4) study methods used; 5) difficulties encountered in obtaining data and completing the proposed study; 6) conclusions including recommendations as to further studies, and 7) any other relevant information.

For purposes of providing interim guidance, the Fish and Wildlife Service considers construction projects to be any action conducted or contracted by the Federal agency designed primarily to result in the building or erection of man-made structures, such as dams, buildings, roads, pipelines, and the like. This includes consideration of major Federal actions such as permits, grants, licenses, or other forms of Federal authorization or approval which may result in construction and which significantly affect the quality of the human environment. In addition, other actions that have the potential of becoming or are controversial, may be considered as construction.

If the biological assessment reveals that the proposed project may affect listed species, the formal consultation process shall be initiated by writing to the Regional Director, Region 2, U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103. If no affect is evident, there is no need for further consultation. We would, however, appreciate the opportunity to review your biological assessment.

The attached sheet provides information on species which may occur in the proposed project area. If we may be of further assistance, do not hesitate to call upon us (505-766-3972; FTS 474-3972).

Jack P Woolstenhulme

Attachment

cc: Phoenix Area Office (SE), Phoenix, Arizona
Field Supervisor, Ecological Services, Albuquerque, New Mexico

McGregor Range Livestock Grazing Proposal
Otero County, New Mexico

LISTED SPECIES

Kuenzler hedgehog cactus (*Echinocereus kuenzleri*) - This endangered cactus is known from two populations in Otero, Chaves, and Lincoln Counties. The plants are found in pinon-juniper woodland on the east side of the Sacramento Mountains, in the vicinity of Elk and 50 miles to the north. Some populations are located on the Lincoln National Forest and may occur in the McGregor Grazing Unit.

Peregrine falcon (*Falco peregrinus*) - This species may exist in the project area as a nesting resident and or migrant.

PROPOSED SPECIES

None.

CRITICAL HABITAT

None.

STATE OF NEW MEXICO

DEPARTMENT OF
FINANCE AND ADMINISTRATION
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Acting

December 19, 1979

Mr. Daniel C. B. Rathbun
Bureau of Land Management
Las Cruces District
P. O. Box 1420
Las Cruces, New Mexico 88001

Dear Mr. Rathbun:

This is to note the results of a consultation between me and Mr. Peter Laudeman and Ms. Candace Ojala of your staff on December 17, 1979, regarding the eligibility to the National Register of Historic Places of certain archeological and historical sites on Bureau lands on McGregor Range, Fort Bliss.

We determined that sufficient information was not available to make possible a determination of the eligibility or ineligibility of the following sites: 77-030-267, 541, 373, 380, 440, 275, 191, 255, 488, 2728, 423, 885, 887, 2576, 143, 523, 578, 597, 746, 712, 715, 716, 750, 776, 2695.

We also determined that the following sites did not meet any criteria of National Register eligibility: 439, 493, 704, 718, 719, 742, 743, 744, 634, 639, 651, 653, 825, 837, 848, 853, 371, 372, 836, 606, 608, 616, 839, 842, 2729, 2730, 2731, 2733, 473, 478, 786, 492, 495, 497, 498, 499, 505, 508, 509, 581, 584, 2741, 2762, 579, 580, 583, 586, 428, 430, 431, 436, 459, 461, 463, 465, 467, 411, 412, 876, 441, 826, 827, 877, 879, 514, 533, 577, 587, 856, 871, 740, 684, 685, 686, 690, 696, 701, 705, 707, 708, 711, 729, 731, 735, 772, 780, 2288, 2648, 2658, 402, 404, 405, 406, 600.

We further determined that the following sites had yielded and were likely to yield significant information regarding the prehistory of the region: 186, 198, 200, 262, 263, 264, 771, 781, 782, 785, 861, 862, 870, 888, 889, 1485, 374, 494, 539, 675, 678, 679, 680, 694, 700, 703, 720, 721, 722, 734, 741, 857, 627, 631, 632, 636, 637, 638, 643, 644, 645, 646, 649, 654, 655, 658, 659, 660, 661, 662, 663, 664, 665, 668, 669, 670, 821, 822, 823, 824, 847, 1093, 522, 528, 529, 2292, 554, 375, 377, 378, 379, 535, 399, 469, 830, 831, 832, 833, 834, 835, 588, 589, 607, 609, 614, 615, 617, 618, 624, 625, 626, 647, 648, 650, 666, 667, 838, 840, 841, 843, 844, 845, 854, 855, 519, 527, 532, 2732, 474, 475, 479, 480, 481, 482, 483, 484, 485, 487, 489, 490, 491, 496, 506, 507, 582, 585, 2742, 2763, 424, 425, 426, 427, 432, 464, 610, 620, 630, 850, 858, 409, 410, 199, 536, 537, 1833, 828, 829, 846, 849, 872, 873, 874, 878, 880, 881, 882, 884, 886, 515, 540, 1498, 521, 524, 530, 531, 534,

Mr. Daniel C. B. Rathbun
December 19, 1979
Page 2

477, 504, 513, 501, 747, 478, 359, 865, 867, 868, 257, 266, 682, 683, 687, 689, 692, 693, 695, 697, 698, 699, 702, 706, 709, 710, 713, 714, 717, 723, 724, 725, 726, 727, 730, 732, 749, 751, 752, 773, 774, 7777, 778, 779, 784, 2287, 516, 517, 518, 520, 2693, 2694, 2696, 393, 394, 395, 396, 403, 407, 590, 591, 595, 596.

We also found that sites 549, 551 and 550 embody the distinctive characteristics of tyoes of construction, as well as being likely to yield significant historical information.

Consensus determinations of site eligibility are subject to review by the Keeper of the National Register, as set forth in 36 CFR 63.

In the same meeting, we also discussed the question of how to analyze a number of site forms in order to incorporate appropriate archaeological and historical information into a Unit Resource Analysis. The site forms were written over a period of almost fifty years and vary greatly in quality and content. It was my conclusion that most of them do not contain information sufficient to permit the National Register eligibility or significance of the sites to be determined. Some sites were well documented, but these were in a small minority.

The Class I document ("An Archeological Synthesis of South Central and Southwestern New Mexico" by LeBlanc and Whalen, 1979) deals with the presently available information.

The information necessary to a meaningful discussion in a Unit Resource Analysis can only be obtained through a stratified random sample or samples of the area in question.

Until such a sample is obtained, our best procedure is to continue to consult on survey reports covering areas of direct effect.

Thank you for your continuing cooperation.

Sincerely,

Thomas W. Merlan
State Historic Preservation Officer
Historic Preservation Bureau

TWM:lm

cc: Glen DeGarmo

GLOSSARY

GLOSSARY

Acre-foot. A measure of water volume. The amount of water it would take to cover one acre of land to a depth of 1 foot; 325,851 gallons; 43,560 cubic feet.

Affinity. The relationship of a site to past cultural group(s), such as Anasazi or Mogollon.

Aggradation. A process of sediments settling in a streambed, thereby filling and raising it.

Aggregates. Combinations of primary soil particles that have formed larger particles.

Air-dry weight. The weight of a substance after it has been allowed to dry to equilibrium with the atmosphere.

Alkaline soil. A soil that has a pH value greater than 7.0, particularly above 7.3, throughout most or all of the root zone. However, the term is commonly applied only to the surface layer or horizon of the soil.

Alluvial fans. A cone-shaped deposit of alluvium made by a stream where the stream runs out onto a level plain or meets a slower stream.

Alluvium. Materials transported and redeposited by water.

Animal unit (AU). Considered to be one mature (1,000 lb.) cow, or its equivalent, based on average daily forage consumption of 26 pounds of dry matter per day.

Animal unit month (AUM). The amount of forage required to sustain the equivalent of one cow, one horse, one elk, five sheep, five goats, seventeen deer or nineteen antelope for one month.

Annuals. Plants produced from seed which complete their life cycle in one growing season.

Aquifer. A water-bearing unit of permeable rock or sediment which is capable of yielding water to wells.

Archaic. A pre-pottery period following the Paleo-Indian stage preceeding the production of maize; a pre-agricultural group.

Artesian water. Ground water which rises in a well above the top of the aquifer due to hydrostatic pressure.

AUM. See animal unit month.

Basal area. The area of ground surface covered by the stem or stems of a range plant, usually measured 1 inch above the soil, in contrast to the full spread of forage.

Base camp habitation. Permanent or recurring habitation sites including campsites, pit houses or surface structures, depending upon the technological development of the cultural group.

Bedrock. The solid rock underlying the soil, underlying the unconsolidated alluvial deposits, or appearing at the surface where soil is absent.

Biomass. The estimated total weight of an entire animal population in a specific area.

BLM. Bureau of Land Management.

Bolson. A flat-floored desert valley that drains to a playa.

Browse. As a verb, to consume, or feed on (a plant); as a noun, the tender shoots, twigs, and leaves of trees and shrubs often used as food by cattle, deer, and other animals.

Browsers. Animals which feed primarily on browse.

Burned rock loci. Sites characterized by the presence of up to five specialized, discrete burned rock features. Large multiple-use hearths are an example of such features.

Calcareous soil. Soil containing sufficient free calcium carbonate or calcium magnesium carbonate to bubble visibly when treated with cold 0.1N hydrochloric acid.

Calcic horizon. A layer of secondary accumulation of carbonates, usually with calcium or magnesium in excess of 15 percent calcium carbonate equivalent and containing at least 5 percent more carbonate than an underlying layer.

Calf crop. The number of calves weaned from a given number of cows bred, usually expressed in percentages.

Caliche. A layer near the surface, more or less cemented by secondary carbonates of calcium or magnesium precipitated from the soil solution. It may occur as a soft, thin soil horizon; as a hard, thick bed just beneath the solum; or as a surface layer exposed by erosion.

Canopy. The space occupied by a plant when viewed from overhead.

Canopy cover. Percent of the ground surface occupied by the canopy.

Ceramic sherds. See sherds.

CFS. Cubic feet per second.

Clay. A mineral soil separate consisting of particles less than 0.002 millimeters in equivalent diameter.

Climax vegetation community. The vegetation community which emerges after a series of successive vegetational stages and perpetuates itself indefinitely unless disturbed by outside forces (such as a change in climate).

CN. Runoff curve number. Its value depends upon plant cover and plant density.

Co-Use Area. An area of 515,000 acres within McGregor Range in which the Department of the Army permits grazing under the supervision of the Bureau of Land Management. Of this area, 271,000 acres are currently grazed.

Coarse fragments. Rock or mineral particles 2.0 millimeters in diameter.

Cobbles. Rounded or partially rounded rock or mineral fragments between 3 and 10 inches in diameter.

Coliform. A group of bacteria used as an indicator of sanitary quality in water. The total coliform group is an indicator of sanitary significance because the organisms are normally present in large numbers in the intestinal tracts of humans and other warm-blooded animals.

Colluvium. Poorly sorted material at the base of steep slopes that have been moved by gravity, frost action, soil creep, or local wash.

Complex. A soil mapping unit in which two or more defined taxonomic units are so intimately intermixed geographically that it is undesirable or impractical, because of the scale being used, to separate them.

Complex camps. Multi-activity, open campsites of less than 3 acres.

Component. The distinguishable evidence of a discrete occupation or use of that site by a group of people.

Cool-season plant. A plant which makes the major portion of its growth during late winter, early spring, and again in the fall.

Cover. Small rocks, litter, basal areas of grass and forbs, and aerial coverage of shrubs that provide protection to the soil surface (i.e., in contrast to bare ground).

Cow-calf operation. A cattle business that sells weaned calves about 9 months of age.

Critical wildlife habitat. That portion of the living area of a wildlife species that is essential to the survival and perpetuation of the species either as individuals or as a population.

dBA. Decibels (A scale). A measurement of sound loudness. The A-scale is designed to measure noises affecting the average human ear.

Debetage flakes. Residue from the process of making and modifying stone tools.

Decibel. A unit for expressing the ratio of two amounts of noise (or other electric or acoustic signal power). Equal to 10 times the common logarithm of this ratio.

Decreaser species. A plant species of the climax vegetation that will decrease in relative abundance with continued use.

Dendrochronology. Dating by counting tree rings.

Direct income. Income that can be traced to a specific source.

Dirt tank. A man-made earthen catchment which retains runoff water for livestock and wildlife use.

DOA. United States Department of the Army.

DOI. United States Department of the Interior.

EA. Environmental Assessment; document which evaluates environmental impacts of actions which do not necessarily have a major, significant impact on the environment. See also EIS.

Ecosystem. A community, including all its component organisms, together with the environment, forming an interacting system.

Ecotone. A transition area between two adjacent ecological communities.

Effective root depth. Depth to which most of the roots of the most common forage species penetrate the soil.

EIS. Environmental Impact Statement. Document which describes the impact of an action (and alternative actions) which has major, significant effects on the human environment.

Endangered species - federally listed. Any species of animal or plant in danger of extinction throughout all or a significant portion of its range.

Endangered species - state list. Species whose prospects of survival or recruitment within the state may become jeopardized in the foreseeable future.

Eolian. Soil materials or deposits which have been transported by wind action.

Ephemeral streams. Streams occurring during rainstorms or at peak snowmelt time. Channels are not well-defined and flow usually persists less than 10 percent of the year.

Erodibility. The relative ease with which one soil erodes under specified conditions as compared with other soils under the same conditions.

Erosion. The wearing away of land surface by wind, running water, and other geological agents.

Evapotranspiration. Loss of water from the soil both by evaporation from the surface and by transpiration from the plants on the land.

Exclosure. An area fenced to exclude animals.

Fan toes. The edge of an alluvial fan.

Fawn/doe ratio. Index of antelope herd status. A low ratio reflects a declining herd size.

Fault blocks. A mass bounded on at least two opposite sides by faults; it may be depressed or elevated relatively to the adjoining region.

Federal Land Policy and Management Act of 1976 (FLPMA). Public Law 94-579 gives the Bureau of Land management the legal authority to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development, and enhancement of the public lands; and for other purposes.

FLPMA. Federal Land Policy and Management Act.

Forage. Plants which are used as food by large herbivores such as cattle and large and small wildlife.

Forage utilization. An index of the extent to which forage is used. Utilization classes range from slight (less than 20 percent) to severe (more than 80 percent).

Forage yield. A measure of plant productivity, expressed as weight per unit area per unit time.

Forb. Herbaceous plants other than grass, such as clover.

FTU. Formazin turbidity units. A measure of clarity of water which is related to the suspended substances in water.

FWS. U.S. Fish and Wildlife Service.

Gpd. Gallons per day.

Gpm. A measure of flow; gallons per minute.

Granivores. Seed-eating animals.

Grass. Any of a family of plants with narrow leaves, jointed stems, and seedlike fruit.

Grazer. An animal that feeds on grasses and other herbaceous vegetation.

Grazing capacity. The maximum stocking rate possible without inducing damage to vegetation or related resources. This incorporates such things as

suitability of the range for grazing as well as the proper use which can be made of each and all the plants within the area. Normally expressed as acres per animal unit month (AC/AUM) or sometimes referred to as the total AUMs available in a given area. It may vary from year to year in the same area because of fluctuating climate and forage production.

Grazing unit. A parcel or parcels of land managed as a unit. A grazing unit may include one or more allotments, but parcels and allotments within most units are contiguous and held by a single licensee.

Ground cover (soil) (hydrologic). All material which covers the ground surface; includes live vegetation, dead vegetative material (litter), small and large rock.

Ground cover (vegetation). Living vegetation which covers a point on the ground surface, when viewed from directly overhead. Includes canopies of trees and shrubs within 20 feet or less of the ground surface and lichens and mosses 1/16 inch or more in thickness.

Ground water recharge. The processes by which water is added to the zone of saturation, or ground water. Examples of such processes are precipitation and infiltration from surface streams.

Gully erosion. Removal of soil leading to formation of relatively large channels or gullies cut into the soil by concentrations of runoff.

Gypsiferous soils. Soils containing gypsum and iron.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Heavy use. Indicates that 60-80 percent of current year's forage production has been eaten or destroyed by grazing animals.

Herbage yield. A measure of plant productivity, expressed as weight of vegetation produced per area per unit time period, such as pounds per acre per year.

Herbivore. An animal which eats plants.

Hydrologic soil groups. There are four categories.

A. Low runoff potential - These soils have high infiltration rates even when thoroughly wetted and consist chiefly of deep, well to excessively drained, sands or gravels. These soils have a high rate of water transmission.

B. Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

C. Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of

water, or soils with moderately fine to fine textures. These soils have a slow rate of water transmission.

D. High runoff potential - Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material.

Increaser species. Plant species which increase as the vegetation composition changes due to use.

Indirect income. Income which is generated as a result of the expenditure of direct income.

Infiltration. Water entering the ground-water system through the land surface.

Infiltration capacity. The rate at which water passes through soil.

Intermittent stream. In this report, a stream which flows at least 30 consecutive days during certain times of the year.

Intrusives. Pottery which is not normally found in a given area.

Invaders. Plants which invade or occupy open space resulting from the loss of other plants initially indigenous to the area.

Isolated hearth. Sites containing one or more small concentrations of fire-cracked rock or ash, ceramic or lithic debris. The sites are thought to represent limited-duration campsites of small groups.

Jornada Mogollon. A branch of the Mogollon culture area. The Mogollon were primarily located in southwestern New Mexico; however, they extended into Arizona, Mexico, and West Texas.

Key forage species. Species whose use serves as an indicator of the degree of use of associated species.

Leaching. A process whereby materials in solution are dissolved from the soil.

Lessee. The recipient of a grazing lease.

Lessor. The entity issuing a grazing lease; in this report, BLM.

Light use. Indicates that 20-40 percent of current year's forage production has been eaten or destroyed by grazing animals.

Limestone. A sedimentary rock consisting chiefly (more than 50 percent) of calcium carbonate, primarily in the form of calcite.

Lithic. A stone or rock exhibiting modification by humans. It generally applies to projectile points, scrapers, chips, etc., rather than ground stone.

Lithic remains. Debris of stones or rocks modified by humans for projectile points, scrapers, etc.

Lithic scatters. Diffuse scatters of lithic artifacts. They appear to represent debris of small groups returning to a particular area over time to take advantage of rock exposures.

Litter. A surface layer of loose organic debris consisting of freshly fallen or slightly decomposed organic materials.

Loam. Soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Mesa. An isolated hill or mountain having abrupt or steeply sloping sides and a level top that is composed of a resistant, nearly horizontal stratum of rock.

Metate. A stone used for grinding corn. Used in conjunction with a mano.

Moderate use. Indicates that 40-60 percent of current year's forage production has been eaten or destroyed by grazing animals.

Monoculture. The cultivation of a single crop.

National Register. The Secretary of the Interior maintains the National Register of Historic Places, which is a register of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology and culture.

Natural unit. An area with a specific, typical pattern of land forms, soils and vegetation.

NMDGF. New Mexico Department of Game and Fish.

NMSU. New Mexico State University.

Ocular reconnaissance survey. A forage survey method which inventories vegetation by estimating total forage density, percent composition by species, and total usable forage in a given range type to determine the carrying capacity for livestock and wildlife.

Off-road vehicle (ORV). Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other terrain.

Overflow area. A flood plain that is temporarily covered with water during high stages of streams.

Overgrazing. Consumption of vegetation by herbivores beyond the endurance of a plant to survive.

Overstocking. A condition in which an area is occupied by more than the optimum number of livestock (wildlife, trees, etc.).

Pace-point transects. A method of estimating the vegetative ground cover which occurs on a predetermined transect line. A notch 1/8 inch wide and 1/16 inch deep is made on the sole of the toe of the boot. As that toe touches the ground, whatever is under or above the notch is recorded, i.e., live vegetation (species), litter (dead vegetative material), rock and bare ground.

Palatability. The relish with which a particular plant species is consumed by an animal. The palatability of a plant is usually related to its ecological significance as far as succession is concerned. That is, highly palatable plants are usually those which are a desirable species and decrease with increasing grazing pressure. Conversely, a low palatability usually characterizes a species which is least desirable and increases with increasing grazing pressure.

Paleo-Indian. Cultural remains of human groups which co-existed with large game, such as mammoths, mastodons in North America.

Parent material. The unconsolidated mass of rock material from which the soil profile develops.

Pasture. A grazing unit separated from other units by a fence.

Percolation. Downward movement of water through soils.

Perennial stream. A stream that flows continuously throughout the year.

Perennials. Plants which may live a few to many years.

Permeability. The measure of capacity for transmitting a fluid through a specific substance, such as rock.

Petrocalcic horizon. A continuous indurated calcic horizon that is cemented by calcium carbonate and, in some places, with magnesium carbonates. Cannot be penetrated with a spade, is impenetrable by roots.

Physiological needs of plants. Requirements of vegetation to survive, to manufacture food, to replenish food reserves, to produce viable seed, and to have new seedlings become established.

Pit house. Living structure which is partly below ground.

Plant density. The number of vegetation individuals per unit of area. Refers to the relative closeness of individual plants to one another.

Plant growth requirements. Pertains to physiological requirements of plants: soil for rooting, water, minerals, light and air.

Plant hummocks. Plants growing in low, rounded hills; considered to be an indicator of range deterioration.

Playa. A shallow basin or dry lake bed in which water from rain or runoff collects and stays until it evaporates.

Potable water. Water of drinking water quality; drinking water.

Pottery seriation. Using pottery with known ages in order to establish likely age of another piece of pottery.

Predator. An animal that preys on one or more other animals.

PRIA. Public Rangelands Improvement Act (PRIA), Public Law 95-514.

Procurement/processing loci. Areas of subsistence and other resource extraction or processing activities.

Proper use factor (PUF). Represents the average weight percentage of a particular plant species, in relation to all other species, that can be safely grazed without restricting forage capacity production.

Pueblo. Of or relating to a culture of the plateau area of the Southwestern U.S.

Radiocarbon date. A method of dating involving the decay rate of the radioactive isotope of carbon-14.

Range condition. The present state of vegetation of a range site in relation to the climax (natural potential) plant community for that site. It is an expression of the relative degree to which the kinds, proportions, and amounts of plants in a plant community resemble that of the climax community for the site. Range condition is basically an ecological rating of the plant community.

Range condition class. One of a series of arbitrary categories used to classify range condition, usually expressed as either excellent, good, fair, or poor in this report. Four classes are used to express the degree to which the composition of the present plant community reflects that of the climax. They are:

Range Condition Class	Percentage of present plant community that is climax for the range site
Excellent	76-100
Good	51- 75
Fair	26- 50
Poor	0- 25

Range conservationist. A person trained in the use and management of natural resources in accordance with principles that assure a sustained yield of renewable benefits and values wthout impairment of environmental quality.

Range improvement. A structure, action, or practice that increases forage production, improves watershed and range condition, or facilitates management of the range or the livestock grazing thereon.

Range productivity. Herbage yield per unit area per unit time.

Range site. A distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. A range site is the product of all the environmental factors responsible for its development. It is capable of supporting a native community typified by an association of species that differs fom that of other range sites in the kind or proportion of species or in total production.

Range trend. The direction of change in range condition; it indicates whether range condition is improving, declining, or remaining stable.

Reaction. The degree of acidity or alkalinity of a soil expressed in pH values. A soil that has a pH of 7.0 is neutral in reaction; acidic reactions are below pH 7.0; alkaline reactions are above pH 7.0.

Recharge. The natural replenishment of groundwater storage by infiltration of surface water. See ground water recharge.

Reservoir. An artificial lake or pond in which water is collected and stored for range management uses. See dirt tank.

Rest. As used in this statement, refers to deferment of grazing on a range area to allow plants to replenish their food reserves.

Retention. Having the capability or capacity to retain, as water in soils.

Retrogression. The process whereby the same area becomes successively occupied by different plant communities of lower ecological order.

Riparian vegetation. Vegetation which occurs in or adjacent to drainage ways and/or their floodplains.

Resource Management Plan (RMP). A BLM planning document.

Rock art. Pictorial representations of symbols, figures, and other cultural meaningful shapes on rock surfaces. The representations can be engraved, ground, pecked, or painted on the rock.

Rockshelters. Occupational areas associated with rock overhangs or recesses.

Runoff. A general term used to describe the portion of precipitation on the land that ultimately reaches streams; may include channel and non-channel flow.

Sacrifice area. Areas which, due to their proximity to water supplies or other resources, receive very heavy livestock utilization each year.

Saline. Indicates the presence of one of several metallic salts, generally potassium, sodium or magnesium compounds, which may occur in soils.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and less than 10 percent clay.

Sandstone. Rock made up of naturally cemented sand.

Section. One square mile or 640 acres.

Sediment. Solid, clastic material, both mineral and organic, that is in suspension, is being transported or has been moved from its site of origin by water, wind, or ice and has come to rest on the earth's surface.

Sedimentary rock. Rock formed of mechanical, chemical, or organic sediment.

Seepage. The percolation of water through the soil; also the loss of water by infiltration from a ditch, pipe etc. Generally expressed as flow volume per unit time.

Severe (or sacrifice) use. Utilization in excess of 80 percent.

Shale. A fissile rock that is formed by the consolidation of clay, mud, or silt; has a finely stratified or laminated structure parallel to the bedding and is composed of minerals that have been essentially unaltered since deposition.

Sheet erosion. More or less uniform removal of soil from an area without the development of conspicuous water channels.

Sherd. A broken piece of a pottery vessel; the most durable of archaeological specimens.

Shortgrass. Subdivision of the temperate grassland biome which is classed by the height of the above-ground parts.

Silt. Sedimentary material consisting primarily of mineral particles intermediate in size between sand and clay.

Slight use. Indicates that 0 to 20 percent of current year's forage production has been eaten or destroyed by grazing animals .

Soil. (i) The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. (ii) The unconsolidated mineral matter of the surface of the earth that has been influenced by genetic and environmental factors including parent material, climate, topography, all acting over a period of time and producing soil that differs from the parent material in physical, chemical, biological, and morphological properties and characteristics.

Soil associations. (i) A group of defined and named taxonomic soil units occurring together in an individual and characteristic pattern over a geographic region, comparable to plant associations in many ways. (ii) A soil mapping unit in which two or more defined taxonomic units occurring together in a characteristic pattern are combined because of map scale or intermixing of taxonomic units.

Soil compaction. A decrease in the volume of a soil as a result of compressive stress from livestock trampling as an example.

Soil depth.

	Lower boundary in inches.
Very shallow	12
Shallow	12 - 20
Moderately deep	20 - 36
Deep	36 - 40
Very deep	40

Soil profiles. A succession of soil zones or horizons beginning at the surface that have been altered by normal soil-forming processes.

Soil series. A group of soils having genetic horizons that, except for texture of the surface layer, have similar characteristics and arrangement in the profile.

Soil texture. The relative proportions of the various soil separates, sand, silt, and clay. A coarse-textured soil would have a greater proportion of large particles.

Solum. The genetic soil developed by soil-building forces. In normal soils, the solum includes the A and B margins or the upper part of the soil profile above the parent material.

Species density. The number of members of a particular plant or animal species in a unit area.

Species diversity. The number of different plant and/or animal species in a community. Used as an index of ecological stability; the greater the diversity, the more stable the ecosystem.

SSF. The abbreviation for Soil Surface Factor. A numerical expression of surface erosion caused by wind and water as reflected by soil movements, surface litter, erosion pavement, pedastalling, rills, flow patterns, and gullies. Values vary from 0 for no erosion condition to 100 for a severe condition.

Stocking rate. The area of land that is allowed to each animal unit for the entire grazeable period of the year. May be expressed as a ratio, such as AUMs per section.

Stratification (vegetative). Vertical layers of vegetation as by height. Examples are: grass, shrubs, pinyon-juniper, ponderosa pine.

Subsistence - resource loci. Areas of subsistence and other resource extraction or processing activities.

Subsoil. Refers to the B horizon of soil with distinct profiles. In soils with weak profile development, subsoil can be defined in terms of arbitrary depths or as the soil below the surface soil in which roots normally grow.

Substratum. The layer beneath the solum, either conforming (C) or unconforming (D).

Suitability. The adaptability or usefulness of an area to grazing by livestock or wildlife.

Swale. A tract of low and sometimes wet land.

Talus slopes. Slopes formed by the accumulation of rock debris.

Taxa. The systematic arrangement of similar plants in classes or categories; in this case, plants identified in the categories of family, genus, species, and variety.

Third-order soils map. Product of a soils survey used for general planning for range or forest land where interpretation of properties is not needed for intensive uses. Mapping units consist of associations, complexes and consociations. Components consist of phases of soil series and, occasionally, soil families. Map scales range from 1:62,000 to 1:250,000; minimum delineations are 6-640 acres.

Threatened species. Any species likely to become endangered within the foreseeable future throughout all or a significant part of its range.

Trough. A long, narrow, open container for holding water for animals; can be built of galvanized steel, or poured in concrete.

TSP. Total suspended particulates. A measure of particulate matter in the air.

Understory. The plants growing beneath the canopy of other plants.

Unifacial. A stone tool only worked on one surface.

URA. Unit resource analysis; a BLM resource inventory document.

USAADC. United States Army Air Defense Center; commonly referred to as the Fort Bliss Army Base.

Utilization. The proportion of current year's forage production that is eaten or destroyed by grazing animals, usually expressed as a percentage. In this report:

Heavy	60 - 80 percent
Moderate	40 - 60 percent
Light	20 - 40 percent
Slight	0 - 20 percent

Vegetal. The vegetative portion of a plant, not its sexual parts.

Vegetative composition. Percentage of vegetation occupied by each species.

Vegetation density. As viewed from above, the percent of ground cover for the current year's growth of all usable vegetation.

Vegetative subtype. A subdivision of a vegetative type which generally indicates an aspect to the viewer of either a single dominant species, or more than one dominant species which are similar in appearance (i.e., vegetative type = conifer; vegetative subtype = ponderosa pine).

Vegetative type. A term used to differentiate vegetation. It generally refers to the species or various combinations of species which have similar stature, morphology, and appearance and dominate or appear to dominate a site, giving it a common appearance.

Vigor. The state of health of a plant. The capacity of a plant to respond to growing conditions, to make and store food, produce food, produce seed, or reproduce vegetatively, that is, by stolens or rhizomes.

Visual resource management class. The degree of alteration that is acceptable within the characteristic landscape. It is based upon the physical and sociological characteristics of any given homogeneous area.

VRM. Visual resource management class.

Warm season grass. A plant which experiences most, or all of its growth during the spring, summer or fall and is usually dormant in winter.

Well yield. The quantity of water, expressed as a rate of flow (i.e. gpm) that can be collected from ground water through a well.

Wildfires. Fires that are started by natural causes such as lightning.

Wind erodibility group (WEG). A group of soils having the same potential for soil blowing.

Winterfat. A cool-season forage plant which is a cross between a forb and a shrub.

WSAs. Wilderness Study Areas. Public lands potentially suitable for designation as wilderness pursuant to the Wilderness Act of 1964 (PL. 88-577).

CONVERSION FACTORS
U.S. Customary to SI (Metric)

U.S. customary unit			SI	
Name	Abbreviation	Multiplier	Symbol	Name
acre	acre	0.405	ha	hectare
acre-foot	acre-ft	1,233.5	m^3	cubic metre
acre-inch	acre-in.	102.79	m^3	cubic metre
cubic foot	ft^3	28.32	L	litre
		0.0283	m^3	cubic metre
cubic feet per minute	ft^3/min	0.0283	m^3/min	cubic metres per minute
cubic feet per minute per 100 gallons	$ft^3/min \cdot 100$ gal	0.00747	$m^3/min \cdot 100$ L	cubic metres per minute per 100 litres
cubic feet per pound	ft^3/lb	62.4	L/kg	litres per kilogram
cubic feet per second	ft^3/s	28.32	L/s	litres per second
cubic feet per square foot per minute	$ft^3/ft^2 \cdot min$	0.305	$m^3/m^2 \cdot min$	cubic metres per square metre per minute
cubic inch	$in.^3$	16.39	cm^3	cubic centimetre
		0.0164	L	litre
cubic yard	yd^3	0.765	m^3	cubic metre
		764.6	L	litre
degrees Fahrenheit	°F	0.555 (°F-32)	°C	degrees Celsius
feet per minute	ft/min	0.00508	m/s	metres per second
feet per second	ft/s	0.305	m/s	metres per second
foot (feet)	ft	0.305	m	metre(s)
gallon(s)	gal	3.785	L	litre(s)
gallons per acre per day	gal/acre·d	9.353	L/ha·d	litres per hectare per day
gallons per capita per day	gal/capita·d	3.785	L/capita·d	litres per capita per day
gallons per day	gal/d	4.381×10^{-5}	L/s	litres per second
gallons per foot per minute	gal/ft·min	0.207	L/m·s	litres per metre per second
gallons per minute	gal/min	0.0631	L/s	litres per second
gallons per square foot	gal/ft^2	40.743	L/m^2	litres per square metre
gallons per square foot per day	$gal/ft^2 \cdot d$	1.698×10^{-3}	$m^3/m^2 \cdot h$	cubic metres per square metre per hour
		0.283	$m^3/ha \cdot min$	cubic metres per hectare per minute
gallons per square foot per minute	$gal/ft^2 \cdot min$	2.445	$m^3/m^2 \cdot h$	cubic metres per square metre per hour
		0.679	$L/m^2 \cdot s$	litres per square metre per second
horsepower	hp	0.746	kW	kilowatts
inch(es)	in.	2.54	cm	centimetre
inches per hour	in./h	2.54	cm/h	centimetres per hour
mile	mi	1.609	km	kilometre
million gallons	Mgal	3.785	ML	megalitres (litres x 10^6)
		3785.0	m^3	cubic metres
million gallons per acre	Mgal/acre	8353	m^3/ha	cubic metres per hectare
million gallons per acre per day	Mgal/acre·d	0.039	$m^3/m^2 \cdot h$	cubic metres per square metre per hour
million gallons per day	Mgal/d	43.808	L/s	litres per second
		0.0438	m^3/s	cubic metres per second
million gallons per square mile	$Mgal/mi^2$	1.461	ML/km^2	megalitres per square kilometre
		1461	m^3/km^2	cubic metres per square kilometre
parts per billion	ppb	1.609	km	kilometre
parts per million	ppm	1.0	mg/L	milligrams per litre
pound(s)	lb	0.454	kg	kilogram(s)
		453.6	g	gram(s)
pounds per acre per day	lb/acre·d	1.121	kg/ha·d	kilograms per hectare per day
pounds per cubic foot	lb/ft^3	16.018	kg/m^3	kilograms per cubic metre
pounds per 1000 cubic feet	$lb/1000\ ft^3$	16.018	g/m^3	grams per cubic metre
		0.016	kg/m^3	kilograms per cubic metre
pounds per mile	lb/mi	0.282	kg/km	kilograms per kilometre
pounds per million gallons	lb/Mgal	0.120	mg/L	milligrams per litre
pounds per square foot	lb/ft^2	4.882×10^{-4}	kg/cm^2	kilograms per square centimetre
		4.882	kg/m^2	kilograms per square metre
pounds per 1000 square feet per day	$lb/1000\ ft^2 \cdot d$	4.882×10^{-3}	$kg/m^2 \cdot d$	kilograms per square metre per day
pounds per square inch	$lb/in.^2$	0.0703	kg/cm^2	kilograms per square centimetre
square foot	ft^2	0.0929	m^2	square metre
square inch	$in.^2$	6.452	cm^2	square centimetre
square mile	mi^2	2.590	km^2	square kilometre
		259.0	ha	hectare
square yard	yd^2	0.836	m^2	square metre
standard cubic feet per minute	std ft^3/min	1.699	m^3/h	cubic metres per hour
ton (short)	ton (short)	0.907	Mg (or t)	megagram (metric tonne)
tons per acre	tons/acre	2240	kg/ha	kilograms per hectare
tons per square mile	$tons/mi^2$	3.503	kg/ha	kilograms per hectare
yard	yd	0.914	m	metre

REFERENCES

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AIRC, 1973. Grazing systems for Arizona ranges. Arizona Intra-agency Range Committee.

Allen, B. L., and Stevan T. Anderson, 1980. Soils support document: McGregor Range Environmental Impact Statement. Lee Wilson and Associates, Santa Fe, New Mexico; prepared for Bureau of Land Management, Las Cruces District.

Anderson, E. William, and Richard J. Scherzinger, 1975. Improving quality of winter forage for elk by cattle grazing. Journal of Range Management 28: 120-125.

Ares, Fred N., 1953. Better cattle distribution through the use of meal-salt mix. Journal of Range Management 6: 341-346.

Arnold, Joseph F., 1942. Forage consumption and preference of experimentally-fed Arizona and antelope jack rabbits. Arizona Agricultural Experiment Station Technical Bulletin 98.

Beale, B.M., and A.B. Smith, 1970. Forage use, water consumption and productivity of pronghorn antelope in western Utah. Journal of Wildlife Management 34(3): 570-582.

BLM, 1977. Unit resource analysis. U.S. Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico.

___, 1978a. McGregor Range deer pellet transects, summer, 1978. A memorandum on file at the District Office, U.S Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico

___, 1978b. McGregor Range browse transects, 1978. In-house report, U.S. Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico.

___, 1978c. Pronghorn count, McGregor Range. A memorandum on file at the District Office, U.S. Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico.

___, 1978d. Pacific Southwest Inter-Agency Committee (PSIAC) methodology for estimating sediment yield on semiarid watersheds and relationship to Bureau inventory data base. Nevada-Utah Watershed Workshop, U.S. Department of the Interior, Bureau of Land Management.

___, 1979a. McGregor Range deer pellet transects, winter, 1979. A memorandum on file at the District Office, U.S. Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico.

___, 1979b. Bureau of Land Management, New Mexico Department of Game and Fish, and Fort Bliss interagency meeting to discuss McGregor deer hunt, 1978. A memorandum on file at the District Office, U.S. Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico.

___, 1979c. Pronghorn count, McGregor Range. A memorandum on file at the District Office, U.S. Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico.

Brown, Albert L., 1950. Shrub invasion of southern Arizona desert grassland. Journal of Range Management 3: 172-177.

Brown, H.L., 1947. Coaction of jack rabbit, cottontail, and vegetation in a mixed prairie. Transactions Kansas Academy of Science, no. 50: 28-44.

Brown, J.W., and J.L. Schuster, 1969. Effects of grazing on a hardland site in the Southern High Plains. Journal of Range Management 22: 418-423.

Buffington, Lee C., and Carlton H. Herbel, 1965. Vegetational changes on a semidesert grassland range from 1858 to 1963. Ecology Monographs 35: 139-164.

Campbell, H., et al., 1973. Effects of hunting and some other environmental factors on scaled quail in New Mexico. Wildlife Monographs No. 34, The Wildlife Society, Washington, D.C.

Campbell, R.S., 1943. Progress in utilization standards for western ranges. Washington Academy of Sciences Journal 33: 161-169.

Campbell, R.S., and E.H. Bomberger, 1934. The occurrence of Gutierrezia sarothrae on Bouteloua eriopoda ranges. Ecology 15: 40-61.

Canfield, R.H., 1939. The effect of intensity and frequency of clipping on density and yield of black grama and tobosa grass. U.S. Department of Agriculture Technical Bulletin 681.

Champie, Clark, 1980. Personal communication. Botanist, El Paso, Texas.

Cook, C.W. and L.A. Stoddart, 1963. The effect of intensity and season of use on the vigor of desert range plants. Society of Range Management 16: 315-317.

Cordova, F.J., Joe D. Wallace, and Rex D. Piper, 1978. Forage intake by grazing livestock: a review. Journal of Range Management 31: 430-438.

Culley, Matt J., 1943. Grass grows in summer or not at all. American Hereford Journal 34(9): 8-10.

Daubenmire, R., 1968. Ecology of fire in grasslands. Advances in Ecological Research 5: 209-266.

DOA, 1976. Draft environmental impact statement, land use withdrawal, McGregor Range. Department of the Army, Fort Bliss, Texas.

___, 1977. Final environmental impact statement, land use withdrawal, McGregor Range. Department of the Army, Fort Bliss, Texas.

Dusek, G.L., 1975. Range relations of mule deer and cattle and prairie habitat. Journal of Wildlife Management 39(3): 605-616.

Dwyer, D.D., 1972. Burning and nitrogen fertilization of tobosa grass. New Mexico State University Agricultural Experiment Station Bulletin No. 595, Las Cruces, New Mexico.

Eicher, Tom, 1978. Sacramento Mountain mule deer investigation. M.S. Thesis, Department of Wildlife and Range Science, New Mexico State University, Las Cruces, New Mexico.

Einarsen, A.S., 1947. The pronghorn antelope and its management. The Wildlife Management Institute.

EPA, 1977. Final environmental impact statement for Albuquerque wastewater treatment facilities. Project no. C-35-1020-01, Environmental Protection Agency, Region VI, Dallas, Texas.

Fitch, H.F., 1947. Ecology of a cottontail rabbit (Silvilagus auduboni) population in central California. California Fish and Game 33(3): 159-184.

Fitch, H.S., and J.R. Bentley, 1949. Use of California annual-plant forage by range rodents. Ecology 30: 306-321.

FWS, 1978. Proposed endangered (FR 6/16/76) plants in New Mexico, known range and habitat summary with county distribution. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Garza, Sergio, and J.S. McLean, 1977. Fresh-water resources in the southeastern part of the Tularosa Basin. Technical Report 40, New Mexico State Engineer, Santa Fe, New Mexico.

Gifford, Gerald F. and Richard H. Hawkins, 1976. Grazing systems and watershed management: a look at the record. Journal of Soil and Water Conservation, Nov.-Dec.: 281-282.

Golley, F.B., 1973. Impact of small mammals on primary production. In: Ecological energetics of homeotherms, J. A. Gessanam, ed., Utah State University Press Monograph Series, Vol. 20: 142-147, Logan, Utah.

Grant, W.E., 1974. The functional role of small mammals in grassland ecosystems. Ph.D. Thesis, Colorado State University, Fort Collins, Colorado.

Griffin, J.R., 1971. Oak regeneration in the upper Carmel Valley, California. Ecology 52: 862-868.

Hanson, Clayton L., et al., 1970. Grazing effects on runoff and vegetation on western South Dakota rangeland. Journal of Range Management 23 (6): 418-420.

Hanson, Clayton L., Armine R. Kuhlman, and James K. Lewis, 1978. Effect of grazing intensity and range condition on hydrology of western South Dakota ranges. South Dakota Agricultural Experiment Station Bulletin 647.

Harper, J.C., 1969. The role of predation in vegetational diversity. In: Diversity and stability in ecological systems: Brookhaven Symposium in Biology No. 22: 48-62.

Hastings, James Rodney, and Raymond M. Turner, 1965. The changing mile - an ecological study of vegetation change with time in the lower mile of an arid and semiarid region. The University of Arizona Press, Tucson, Arizona.

Heady, H.F., 1975. Rangeland management. McGraw-Hill Book Company, New York, New York.

Herbel, C.H., 1965. Reseach on improvement of brush-infested grazing land on the Jornada experimental range. Talk given to Far West Texas Association of Soil Conservation Districts, El Paso, Texas.

Herbel, Carlton H., and Arnold B. Nelson, 1966. Species preference of Hereford and Santa Gertrudis cattle on a southern New Mexico range. Journal of Range Management 19: 177-181.

Houghton, Frank E., 1972. Climate. In: Soil associations and land classifications for irrigation, Otero County; New Mexico State University, Agricultural Experimental Station Research Report 238: 7-8, Las Cruces, New Mexico.

Hubbard, J.P., 1979. Draft handbook of species endangered in New Mexico. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Humphrey, R.R., 1952. The desert grassland, past and present. Journal of Range Management 5.

Humphrey, R.R., and L.A. Mehrhoff, 1958. Vegetation changes on a southern Arizona grassland range. Ecology 39: 720-726.

Jameson, D.A., 1970. Value of broom snakeweed as a range condition indicator. Journal of Range Management 23: 302-304.

Jenkins, David N., and Gail McGough, 1980. Water support document: McGregor Range grazing environmental impact statement. Lee Wilson and Associates, Santa Fe, New Mexico; report prepared for Bureau of Land Management, Las Cruces District.

Johnson, Leslie E., et al., 1951. Cows, calves, and grass. South Dakota State College, Agricultural Experiment Station, Bulletin 412.

Keheler, William A., 1962. The fabulous frontier. University of New Mexico Press, Albuquerque, New Mexico.

Klipple, G.E., and David F. Costello, 1960. Vegetation and cattle responses to different intensities of grazing on short-grass ranges on the central Great Plains. U.S. Department of Agriculture Technical Bulletin No. 1216.

Klipple, G.E., and R.E. Bement, 1961. Light grazing; is it economically feasible as a range-improvement practice? Society of Range Management 14: 57-62.

LeBlanc, S.A., and M.E. Whalen, in preparation. An archaeological synthesis of south central and southwestern New Mexico. On file at the District Office, U.S. Department of the Interior, Bureau of Land Management, Las Cruces, New Mexico.

Lehmer, D.J., 1948. The Jornada branch of the Mogollon. University of Arizona Social Science Bulletin No. 17, Tucson, Arizona.

Lewis, James K., et al., 1956. Intensity of grazing. South Dakota State College, Agricultural Experiment Station, Bulletin 459.

Liaces, L.G., 1962. Water yield as influenced by the degree of grazing in the California winter grassland. Journal of Range Management 15: 34-42.

Lord, Kenneth J., 1980. Cultural resource support document: McGregor Range grazing environmental impact statement. Center for Anthropological Studies, Albuquerque, New Mexico; report prepared for Bureau of Land Management, Las Cruces District.

Marshall, Larry, 1975. Rest rotation - a new concept in range management. Western Livestock Journal.

Martin, A.C., H.S. Zim, and A.L. Nelson, 1961. American wildlife and plants: A guide to wildlife food habits. Dover Publications, Inc., New York.

Martin, S. Clark, 1978. Grazing systems - what can they accomplish? Rangeman's Journal 5: 14-16.

___, 1975. Why graze semi-desert ranges? Journal of Soil and Water Conservation 30(4): 186-188.

Martin, S.C., and D.R. Cable, 1974. Managing semi-desert grass-shrub ranges. U.S. Department of Agriculture, Forest Service Technical Bulletin No. 1480.

Martin, S.C., and Donald E. Ward, 1970. Rotating access to water to improve semidesert cattle range near water. Journal of Range Management 23: 22-26.

Martin, W.P., and L.R. Rich, 1948. Preliminary hydrologic results, 1934-1948, "base rock" undisturbed soil lysimeters in the grassland type, Arizona. Soil Science Society of America Proceedings 13: 561-567.

McCawley, P.F., and B.E. Dahl, in press. Nutritional characteristics of high yielding exotic grasses for seeding cleared south Texas brushland. Journal of Range Management (to appear in early 1980).

McDougal, L., and C. Jackson, 1973. Peak rates of discharge for small watersheds. In: Engineering Field Manual for Conservation Practices, as revised for New Mexico, U.S. Department of Agriculture, Soil Conservation Service.

McLean, J.S., 1970. Saline ground-water resources of the Tularosa Basin, New Mexico. U.S. Department of the Interior, Office of Saline Water Research and Development Progress Report No. 561.

Meyer, W.R., 1976. Digital model for simulated effects of ground-water pumping in the Hueco Bolson, El Paso area, Texas, New Mexico, and Mexico. U.S. Department of the Interior, Geological Survey, Water Resources Investigations 58-75, Austin, Texas.

Miller, R.F., and F.B. Donart, 1979. Response of Bouteloua eripoda (Torr.) Torr. and Sporobolus flexuosos (thrub.) Rybd. to season of defoliation. Journal of Range Management 32: 63-66.

Neff, D.J., 1965. Deer population trend techniques. Completion Report, Federal Aid Project W-78-R-9, WP-1, J-4. Arizona Game and Fish Department, Phoenix, Arizona.

Nelson, Arnold B., C.H. Herbel, and H.M. Jackson, 1970. Chemical composition of forage species grazed by cattle on an arid New Mexico range. New Mexico State University, Agricultural Experimental Station, Bulletin 561, Las Cruces, New Mexico.

Nelson, Enoch W., 1934. The influence of precipitation and grazing upon black grama grass range. U.S. Department of Agriculture Technical Bulletin 409.

Norris, J.J., 1950. Effect of rodents, rabbits, and cattle on two vegetation types in semidesert rangeland. New Mexico Agricultural Experiment Station Bulletin 353.

Paulsen, Harold A., and Fred N. Ares, 1962. Grazing values and management of black grama and tobosa grasslands and associated shrub ranges of the southwest. U.S. Department of Agriculture, Forest Service Technical Bulletin No. 1270.

Pettit, R.D., 1979. Effect of Picloram pebuthiuron pellets on San Shinnery oak communities. Journal of Range Management 32: 196-200.

Pettit, Russell, Ron Sosebee, and William Dahl, 1980. Vegetation support document: McGregor Range grazing environmental impact statement. Lee Wilson and Associates, Santa Fe, New Mexico; report prepared for Bureau of Land Management, Las Cruces District.

Pielou, E.C., 1974. Population and community ecology, principles and method. Gordon and Breach Science Publishers, New York, New York.

Pieper, Rex D., Kenneth H. Rea, and Joseph G. Fraser, 1974. Ecological characteristics of walking stick cholla. New Mexico State University, Bulletin 623, Las Cruces, New Mexico.

Pond, F.W., 1957. Vigor of Idaho fescue in relation to different grazing intensities. Society of Range Management 13: 28-30.

Potter, L.D., and J.C. Krenetsky, 1967. Plant succession with released grazing on New Mexico rangelands. Journal of Range Management 77: 34-38.

PSIAC, 1968. Factors affecting sediment yield and measures for the reduction of erosion and sediment yield. Pacific Southwest Inter-Agency Committee, Report of the Water Management Subcommittee.

Ragsdale, Bobby Jo, 1969. Ecological and phenological characteristics of perennial broomweed. Ph.D. dissertation, Texas A&M, College Station, Texas.

Rasmussen, D.I., and Doman, E.R., 1943. Census methods and their application in the management of mule deer. North American Wildlife Conference 8: 369-379.

RCD, 1976. Data on fires, July, 1973 - June, 1976. Range Command Data, 95th Engineer Detachment, Fort Bliss, Texas.

Reardon, P.O. and L.B. Merrill, 1976. Vegetative response under various grazing management systems in the Edwards Plateau of Texas. Society of Range Management 29: 195-198.

Reynolds, H.G., and J.W. Bohning, 1956. Effects of burning on a desert grass-shrub range in southern Arizona. Ecology 37: 769-777.

Reynolds, H.G., and S. Clark Martin, 1968. Managing grass-shrub cattle ranges in the southwest. U.S. Department of Agriculture, Forest Service Agriculture Handbook #162.

Rodgers, C., O. Julander, and W.L. Robinette, 1958. Pellet-group counts for deer census and range-use index. Journal of Wildlife Management 22(2): 193-199.

Russell, P., 1968. Folson Complex near Orogrande, New Mexico. The Artifact 6 (2): 11-16.

Russell, T.T., 1964. Antelope of New Mexico. State of New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Ryel, L.A., 1959. Deer pellet group surveys on an area of known herd size. Michigan Department of Conservation, Game Division Report 2252.

Savory, Allan, 1978. Range reclamation and principles. In: Beef Cattle Science Handbook, Vol. 15: 372-375.

Schemnitz, Sanford D., 1961. Ecology of the scaled quail in the Oklahoma panhandle. Wildlife Monographs No. 8, The Wildlife Society, Washington D.C.

Schneider, B.H., B.K. Soni, and W.E. Ham, 1955. Method for determining consumption and digestibility of pasture forages. Washington Agricultural Experiment Station Technical Bulletin 16, Pullman, WA.

Scott, Arthur G. and J.L. Kunkler, 1976. Flood discharges of streams in New Mexico as related to channel geometry. U.S. Geological Survey Open File Report 76-414, Albuquerque, New Mexico.

Scott, Norman, et al., 1976. Manual of techniques for biological investigations in arid lands. Unpublished manuscript, University of New Mexico Museum of Southwestern Biology, National Fish and Wildlife Laboratory, Albuquerque, New Mexico.

SCS, 1971. National list of scientific plant names. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

___, 1972. Normal annual precipitation, New Mexico. Map 9: New Mexico Water Resources Assessment for Planning Purposes, U.S. Bureau of Reclamation. U.S. Department of Agriculture, Soil Conservation Service.

___, 1975. Wind erosion equation. New Mexico Conservation Agronomy Technical Note 28, U.S. Department of Agriculture, Soil Conservation Service, Las Cruces, New Mexico.

___, no date. Otero County soils manual. Unpublished manuscript, U.S. Department of Agriculture, Soil Conservation Service, Alamogordo, New Mexico.

___, in preparation. Otero County soils survey. U.S. Department of Agriculture, Soil Conservation Service, Alamogordo, New Mexico.

Skidmore, E.L., and N.P. Woodruff, 1968. Wind erosion forces in the United States and their use in predicting soil loss. U.S. Department of Agriculture, Agricultural Handbook 346, Washington D.C.

Smartt, Richard A., 1977. The ecology of late Pleistocene and Recent Microtus from south central and southwestern New Mexico. The Southwestern Naturalist 22(1): 1-19.

___, 1978. A comparison of ecological and morphological overlap in a Peromyscus community. Ecology 59(2): 216-220.

___, 1979. Trophic and structural plasticity in arid land rodent communities. Unpublished manuscript, University of Texas at El Paso, El Paso, Texas.

___, 1980. Wildlife support document: McGregor Range grazing environmental impact statement. Lee Wilson and Associates, Santa Fe, New Mexico; report prepared for Bureau of Land Management, Las Cruces District .

Smith, A.D., 1964. Defecation rates of mule deer. Journal of Wildlife Management 28(3): 435-444.

Smith, C.C., 1940. The effect of overgrazing and erosion upon biota of the mixed grass-prairie of Oklahoma. Ecology 21: 318-397.

Smith, David A. and Ervin M. Schmutz, 1975. Vegetative changes on protected versus grazed desert grass-land ranges in Arizona. Journal of Range Management 28: 453-458.

Smith, Dwight R., 1967. Effects of cattle grazing on a Ponderosa pine-bunchgrass range in Colorado. Technical Bulletin no. 1371, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Smith, E. Lamar, 1979. Evaluation of the range condition concept. Rangelands 1(2): 52-54.

Smoliak, S., J.F. Dormaar, and A. Johnston, 1972. Long-term grazing effects on Stipa-Bouteloua prairie soils. Society of Range Management 25: 246-250.

Snyder, Dana P., ed. 1976. Populations of small mammals under natural conditions. Symposium volume, 5, Pymatuning Lab. of Ecology, University of Pittsburgh, Pittsburgh, PA.

Soil Survey Staff, 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Department of Agriculture, Agricultural Handbook No. 436, Washington, D.C.

Soil Survey Staff, 1978. Unpublished material. U.S. Department of Agriculture.

Spellenberg, R., and D. Mathwig, 1977. Visual sighting of M. Villosa. Species list submitted to BLM, Las Cruces District.

SPRC, 1978. A planning guide for the development of the Oliver Lee Memorial State Park - Otero County. New Mexico State Park and Recreation Commission, Santa Fe, New Mexico.

Springer, Marlin D., 1979. Final report: Wildlife nutritional literature review of vegetation production and allotments on southwestern New Mexico rangeland. LGL Ecological Research Associates; report prepared for Bureau of Land Management, Las Cruces District.

Springfield, H.W., 1961. The grazed plant method for judging the utilization of crested wheatgrass. Journal of Forestry 59: 667-670.

Stephenson, G.R., and L.V. Street, 1978. Bacterial variations in streams from southwest Idaho rangeland watershed. Journal of Environmental Quality 7(1): 150-159.

Talbot, M.W., 1926. Range watering places in the Southwest. U.S. Department of Agriculture Bulletin 1358.

Titus, Frank B., Jr., 1967. Central Closed Basins: Geography, geology and hydrology. In: Water resources of New Mexico, pp. 97-126; compiled by New Mexico State Engineer Office in cooperation with New Mexico Interstate Stream Commission, and New Mexico State Planning Office, Santa Fe, New Mexico.

Urness, P.J., W. Green, and R.K. Watkins, 1971. Nutrient intake of deer in Arizona chaparral. Journal of Wildlife Management 35(30): 469-475.

USDA, Forest Service, 1962. Range research methods. U.S. Department of Agriculture, Forest Service, Miscellaneous Publication No. 940.

Valentine, K.A., 1970. Influence of grazing intensity on improvement of deteriorated black grama range. New Mexico State University, Bulletin 553, Las Cruces, New Mexico.

Valentine, K.A. and J.B. Gerard, 1968. Life-history characteristics of the creosote bush, Larrea tridentata. Bulletin 526, New Mexico State University, Las Cruces, New Mexico.

Von Finger, Kevin, 1979. Personal communication. U.S. Department of the Army, Environmental Office, Fort Bliss, Texas.

Weaver, J.E., and F.W. Albertson, 1956. Grasslands of the Great Plains. Johnson Publishing Co., Lincoln, Nebraska.

Weaver, J.E., and N.W. Roland, 1952. Effects of excessive natural mulch on development, yield and structure of native grasslands. Botany Gazette 114: 1-19.

Wedel, W.R., 1957. The Central North American grassland: man-made or natural? In: Social Science Monograph III, pp. 39-69, Anthropological Society, Washington, D.C.

West, N.E., 1968. Rodent-influenced establishment of Ponderosa pine and bitterbrush seedings in central Oregon. Ecology 49: 1009-1011.

Whitman, W.C., 1971. Influence of grazing on the microclimate of mixed grass prairie. In: U.S. Department of Agriculture, Miscellaneous Publication No. 1271: 207-218.

Wiens, J.A., and M.I. Dyer, 1975. Rangeland avifaunas: their composition, energetics and role in the ecosystem. In: Proceedings of the Symposium on the Management of Forest and Range Habitat for Nongame Birds, U.S. Department of Agriculture Forest Service GTR WO-1, pp. 146-182.

Wilson, Lee, 1975. Application of the wind erosion equation in air pollution surveys. Journal of Soil and Water Conservation 30(5): 215-219.

Wilson, Lee and Associates, 1974. Suspended particulates in southwestern New Mexico. Preliminary report to the Environmental Improvement Agency, State of New Mexico, Santa Fe, New Mexico.

Wimberly, et. al., 1973. In: Human Systems Research, 1973, Technical Manual, 1973 Survey of the Tularosa Basin, Tularosa, New Mexico.

Wood, J., 1979. Personal communication. New Mexico State Highway Department, Santa Fe, New Mexico.

Wood, John E., et. al., 1970. The Fort Stanton mule deer herd. New Mexico State University Agricultural Experiment Station Bulletin No. 567.

Wright, H.A., 1969. Effect of spring burning on tobosa grass. Journal of Range Management 22: 425-427.

York, J.C., and W.A. Dick-Peddie, 1969. Vegetation changes in southern New Mexico during the past hundred years. In: Arid Lands in Perspective, W. G. McGinnis and B. J. Goldman, eds., University of Arizona Press, Tucson, Arizona.

INDEX

INDEX

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